5. IMPLEMENTABILITY (40 CFR 300.430 [e][9][iii][F]) and (EPA/540/G-89/004, § 6.2.3.6)

The implementability criterion addresses the technical feasibility, administrative feasibility, and the availability of various services and materials required to implement an alternative. Figure 13 shows the hierarchy of implementability within CERCLA. (Note: This hierarchy is only provided graphically for implementability, but exists for the other CERCLA criteria, as described in the following sections.)

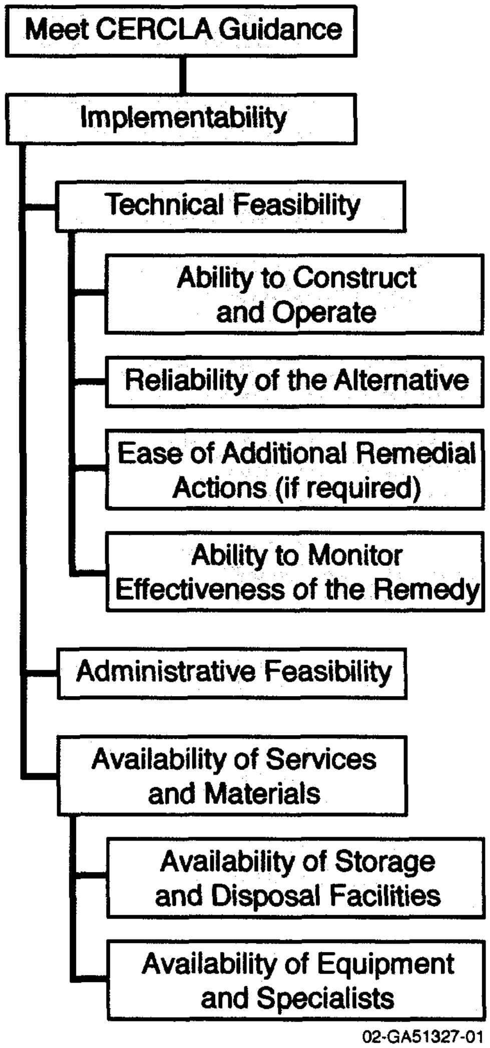


Figure 13. Hierarchy of implementability within the Comprehensive, Environmental Response, Compensation, and Liability Act.

5.1.1 Technical Feasibility (40 CFR 300.430 [e][9][iii][F][1]) and (EPA/540/G-89/004, § 6.2.3.6)

The CERCLA further subdivides technical feasibility into the subcriteria listed in Figure 13. These subcriteria are discussed in more detail in the following sections.

5.1.1.1 Ability to Construct and Operate. This subcriterion addresses the technical difficulties and unknowns associated with a technology. Decision-makers must consider the difficulties and uncertainties associated with construction and operation of the remedial alternatives being considered. Figure 14 shows the V-Tank area, illustrating the proximity to existing buildings at TAN.

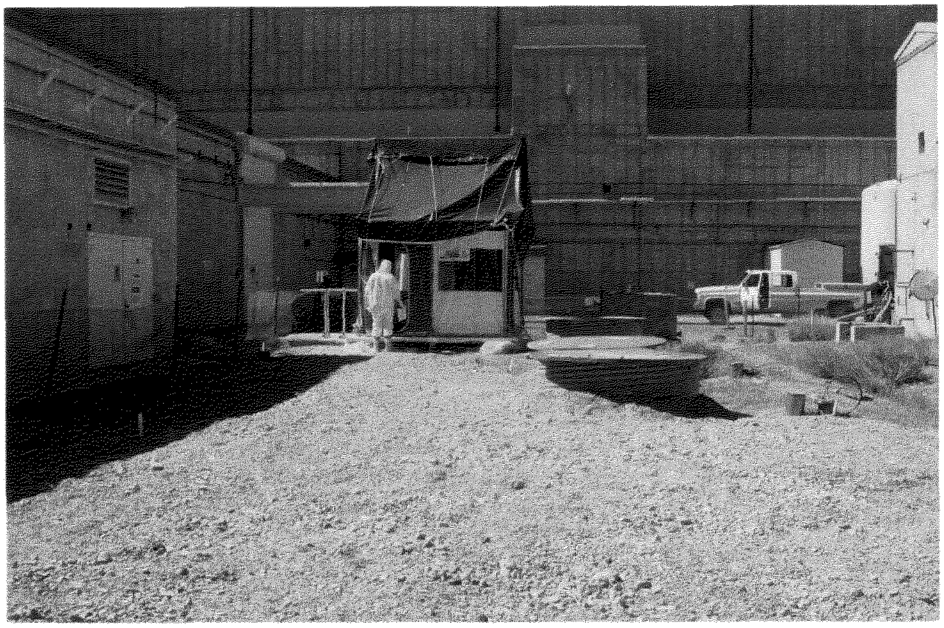


Figure 14. View of V-Tank area at Test Area North during Tank V-9 sampling (looking south).

For the alternatives under consideration, it was determined that an effective method for measuring the ability to construct and operate was to evaluate the technology's maturity. Figure 15 shows the value function for this metric. For the purposes of this technology evaluation, the following definitions of technology maturity were used:

- Research—performed either as a paper study or bench-scale test, performed with respect to any comparable media
- Development—performed bench-scale or pilot-scale, performed on soil or sludge, used surrogates for key contaminants
- Demonstration—performed on a scale sufficient to prove the concept for implementation, performed on soil or sludge, used some contaminants
- Used in Similar Application—performed in same environment (e.g., if in situ, in a tank), used same media, used some contaminants (e.g., hazardous not radioactive)
- Used Routinely—performed routinely either commercially or within the DOE complex, used many of the same contaminants.

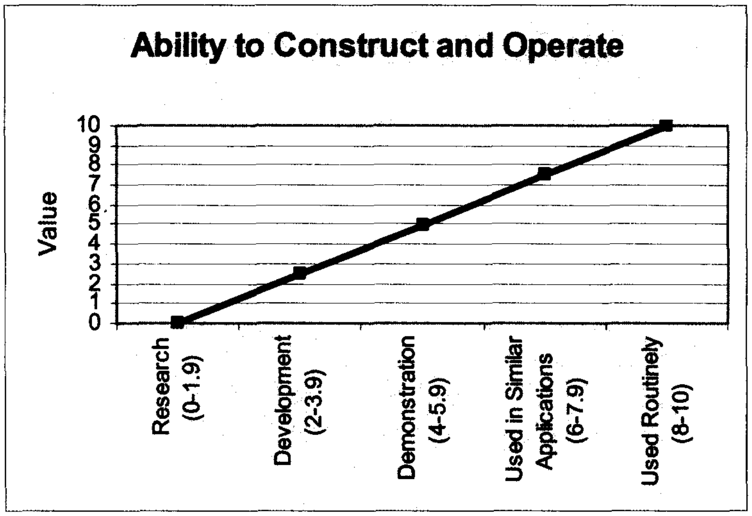


Figure 15. Ability to construct and operate.

5.1.1.2 Reliability of the Alternative. This subcriterion addresses the likelihood that technical problems associated with implementation will lead to schedule delays. A metric for a given process's number of major components was determined to be appropriate, using the logic that the more components there are, the more likely technical problems will occur that could result in schedule delays. Figure 16 shows the value function for this metric.

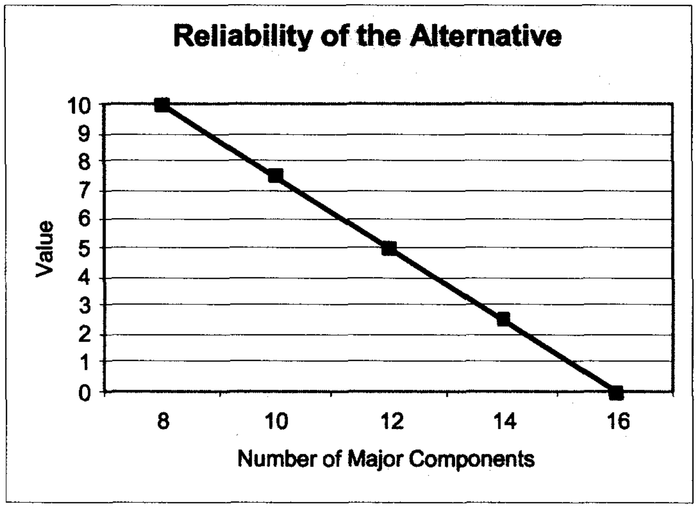


Figure 16. Reliability of the alternative.

5.1.1.3 Ease of Additional Remedial Actions. This subcriterion addresses future remedial actions that might need to be undertaken and how difficult it would be to implement such additional actions. Since V-Tank remediation will result in clean closure, this is interpreted to mean recovery if initial treatment does not meet RAOs. If immediate recovery were possible using the same technology, then the alternative would receive a high rating (10). On the other hand, the situation might be recoverable by changing a parameter within the alternative (e.g., temperature or a chemical mix). Under these circumstances, the alternative might receive a rating of 8. If it were not possible to recover using the same technology, the alternative would receive a rating of 0. Figure 17 shows the value function for this metric.

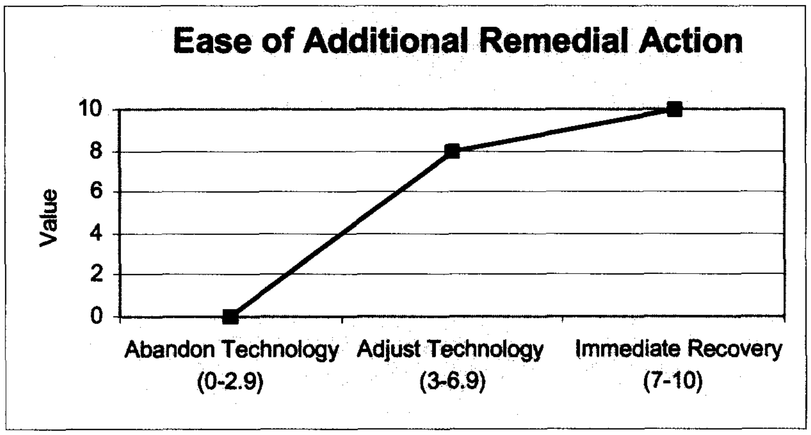


Figure 17. Ease of additional remedial action.

5.1.1.4 Ability to Monitor the Effectiveness of the Remedy. This subcriterion addresses the ability to monitor the remedy's effectiveness and includes an evaluation of the exposure risks, should monitoring be insufficient to detect a system failure. Since the V-Tanks' remedial action will result in clean closure, this criterion applies to monitoring the V-Tanks and surrounding area during the remedial actions. The metric addresses the risks, should monitoring be insufficient. Figure 18 shows the value function for this metric and the potentially impacted receptors.

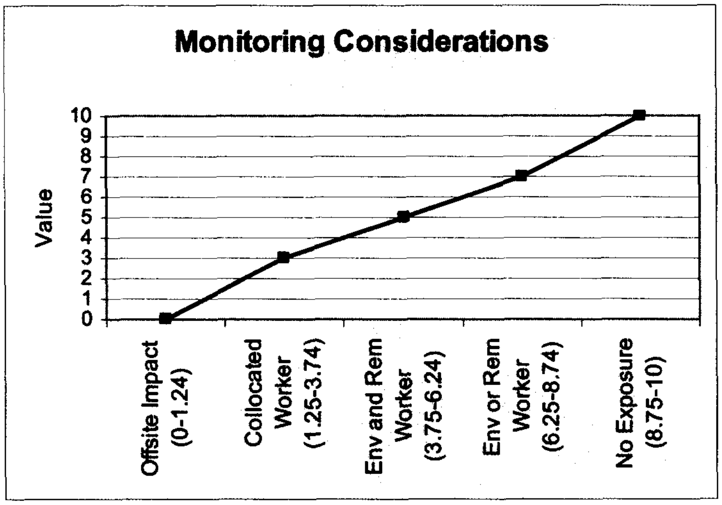


Figure 18. Monitoring considerations.

5.1.2 Administrative Feasibility (40 CFR 300.430 [e][9][iii][F][1]) and (EPA/540/G-89/004, § 6.2.3.6)

This subcriterion addresses the feasibility of obtaining both internal and external administrative approval to proceed with each proposed technology at the INEEL. The administrative feasibility subcriterion is associated with administrative approvals from INEEL management, as well as the Agencies involved in environmental remediation decision-making at the INEEL (DOE-ID, IDEQ, and EPA Region 10) and other agencies involved in off-Site disposal decisions (as applicable).

To facilitate the determination of each technology's administrative feasibility rating, a metric was developed based on five major administrative processes and their estimated complexity for each of the seven technologies under consideration. The five major administrative processes include:

- Completing the safety analysis documentation for the proposed technology
- Completing the operational readiness (OR) process for the proposed technology
- Obtaining regulatory approval for each technology as an acceptable alternative for retorting mercury (if applicable)
- Obtaining regulatory approval for each technology as an alternative process for PCB destruction (if applicable)
- Obtaining approval for off-Site disposal of the primary waste stream, after treatment (if applicable).

Each proposed technology will be assigned a level of complexity between 0 and 1 (in 0.25 increments), for each of these major administrative processes (0 = not applicable, 0.25 = minor, 0.5 = moderate, 0.75 = major, and 1.0 = extreme). Then, the sum of these complexities will be added up to define a total administrative feasibility complexity input value, between 0 and 5, for each proposed technology. These input values will be applied to the inverse-linear curve shown in Figure 19.

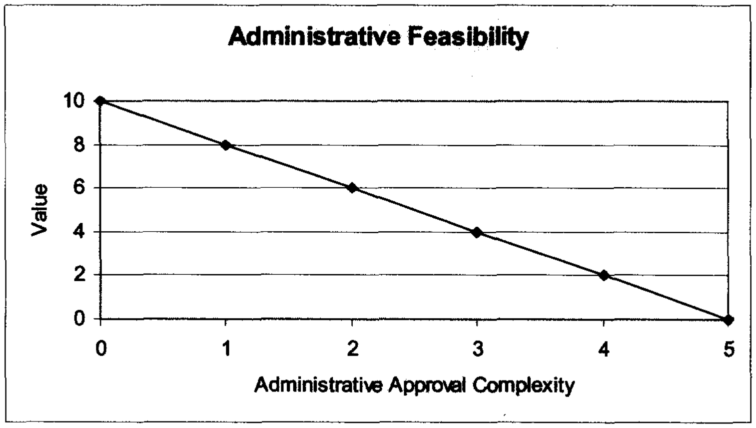


Figure 19. Administrative feasibility.

Chemical oxidation/reduction is an example of a remedial alternative impacted by this criterion. For example, applicable regulations require incineration for the treatment of PCBs. Conventional in situ vitrification is considered an acceptable alternative to incineration, but chemical oxidation/reduction will require a risk-based equivalency petition. Other examples of activities that might require additional administrative approvals include obtaining special permission for disposal of hazardous waste at other DOE facilities that are currently not accepting these waste types from out of state.

5.1.3 Availability of Services and Materials (40 CFR 300.430 [e][9][iii][F][1]) and (EPA/540/G-89/004, § 6.2.3.6)

Availability of services and materials directly affects whether a remedial alternative can be implemented. This criterion addresses the availability of services—such as treatment capability, storage capacity, disposal services, and the availability of necessary equipment and specialists—and the availability of prospective technologies, including the potential for obtaining competitive bids.

5.1.3.1 Availability of Treatment, Storage, and Disposal Facilities.

This subcriterion directly addresses the availability of TSDFs for remediation alternatives that require them. As noted in Section 2, several disposal facilities are not currently accepting out-of-state mixed waste, which influences the decision to produce a waste stream that relies on this acceptance being forthcoming. Figure 20 shows the value function of this metric.

The Agencies agreed that a factor would be applied to this metric to adjust for the amount of control the INEEL has over the TSDFs planned for the various alternatives. If the INEEL has control over TSDFs, a control factor multiplier of 1 was used. If the INEEL has control over either treatment, storage or disposal, a control factor multiplier of 0.8 was used. If the INEEL has no control of the treatment, storage or disposal facilities, a control factor multiplier of 0.6 was used. Figure 21 shows the control factor for this metric.

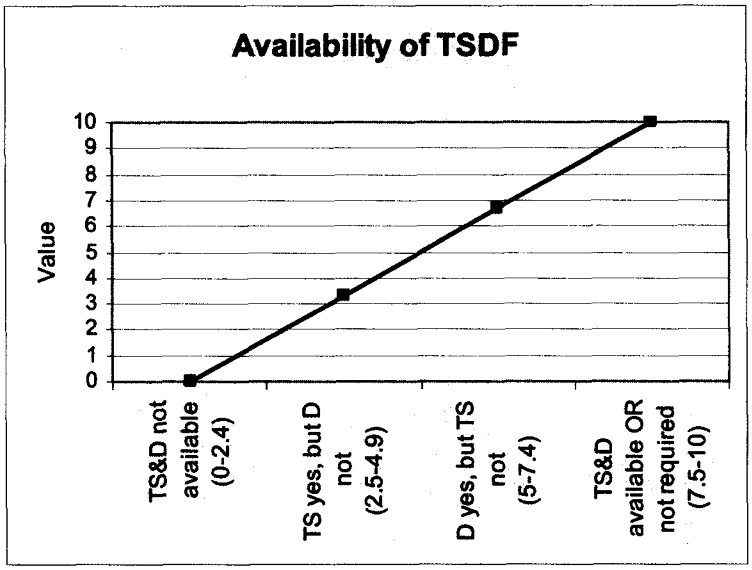


Figure 20. Availability of treatment, storage, and disposal facility.

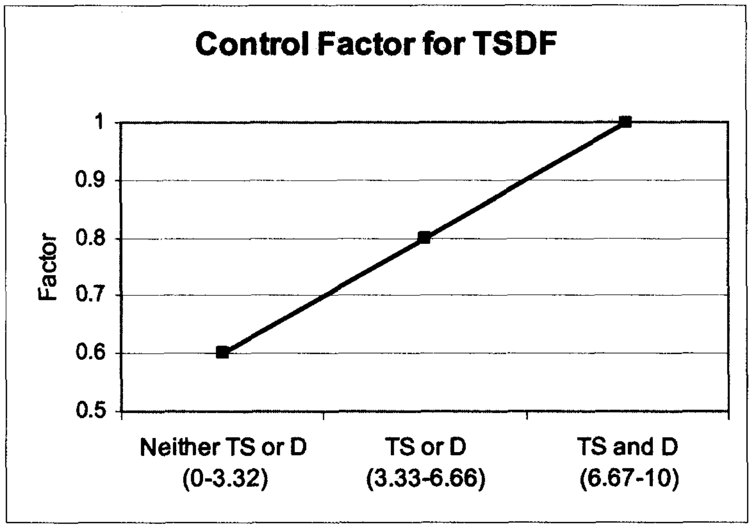


Figure 21. Control factor for treatment, storage, and disposal facility.

5.1.3.2 Availability of Equipment and Specialists. This subcriterion addresses the availability of necessary equipment and specialists, and it addresses provisions to ensure that any necessary additional resources will be available. One of the metrics that was considered was the number of subcontractors available for each remedial alternative. However, it was determined that the level of confidence in a vendor's ability to implement the remedial alternative was more appropriate. Figure 22 shows the value function for this metric. The confidence rating also will consider whether the alternative has been used in a radiological environment and whether the potential vendor has previous DOE experience.

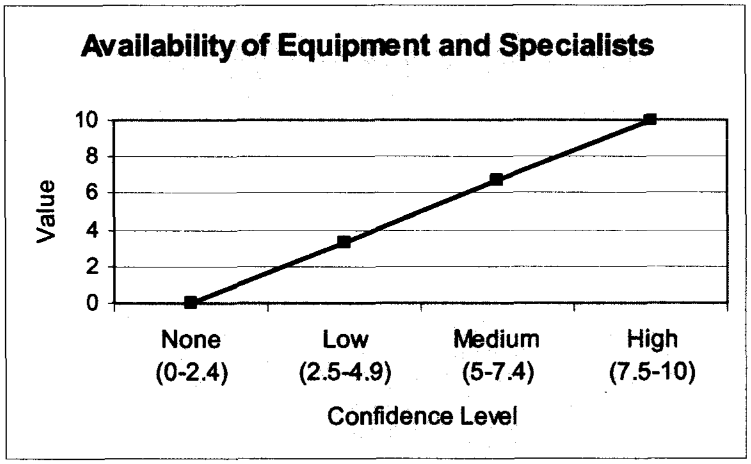


Figure 22. Availability of equipment and specialists.

Another related subcriterion under Availability of Services and Materials is the availability of prospective technologies. This criterion also addresses the technology's maturity and the vendors available to implement the technology. However, it was decided that the metrics for this criterion are already being addressed under Technical Feasibility, Ability to Construct and Operate, Availability of Services and Materials, and Availability of Necessary Equipment and Specialists.

5.2 Short-Term Effectiveness (40 CFR 300.430 [e][9][iii][E]) and (EPA/540/G-89/004, § 6–9)

This evaluation criterion addresses the alternative's effects on human health and the environment during the construction and implementation phase until the remedial response objectives have been met. The following should be addressed, as appropriate, for each alternative: (1) protection of the community during remedial actions, (2) protection of workers during remedial actions, (3) environmental impacts, and (4) the length of time until remedial response objectives are achieved.

5.2.1 Length of Time to Remediate (EPA/540/G-89/004, § 6–9) and (40 CFR 300.430 [e][9][iii][E][4])

This subcriterion includes an estimate of the time required to remediate the tank waste and remediate the entire site, including disposition of all associated waste streams. Two metrics were developed to depict these durations. The first metric, in Figure 23, is the value function for the time from approval of the amended ROD until the tank waste is treated and retrieved or is in stable form (in the case of in situ treatments). The second metric, in Figure 24, is the value function for the time to achieve site closure, including disposition of all associated waste streams. This is defined as the time from approval of the amended ROD to when the ROD is fully implemented.

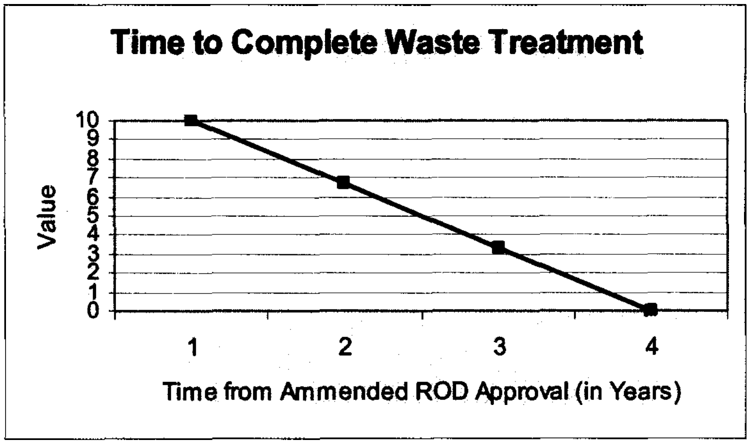


Figure 23. Time to complete waste treatment.

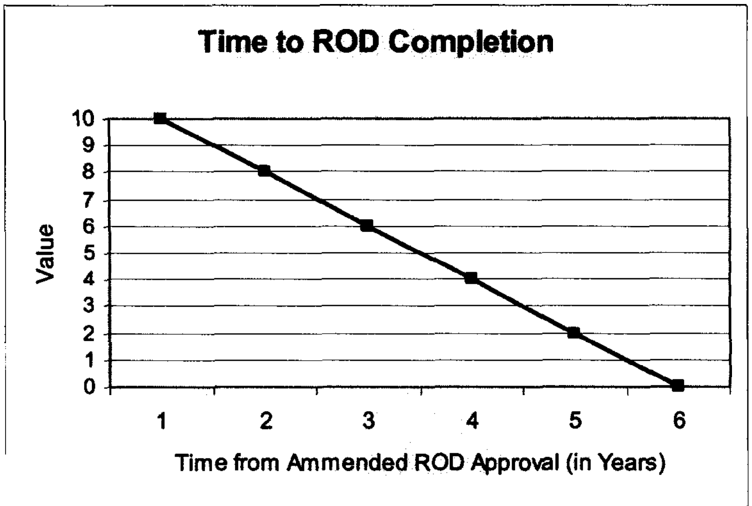


Figure 24. Time to Record of Decision completion.

5.2.2 Community Protection (40 CFR 300.430 [e][9][iii][E][1]) and (EPA/540/G-89/004, §6–9)

This subcriterion satisfies the CERCLA requirement to address protection of the surrounding community during the remedial action.

The INEEL's vast expanse makes the probability extremely low that any project hazards will affect anyone off-Site. Therefore, it was determined that shipping contaminated waste off-Site gives the highest potential for exposure to the community. Thus, the metric addresses whether treated or untreated waste (some or all) is transported off the INEEL. Figure 25 shows the value function for this metric.

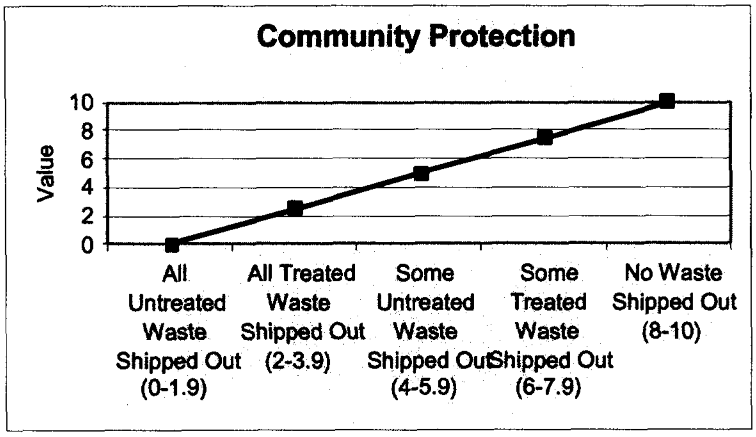


Figure 25. Community protection.

5.2.3 Worker Protection (40 CFR 300.430 [e][9][iii][E][2]) and (EPA/540/G-89/004, §6–9)

This subcriterion satisfies the CERCLA requirement to address protection of workers during the remedial action. This factor assesses threats that might be posed to workers and the effectiveness and reliability of protective measures that would be taken.

Figure 26 shows the value function for this metric. The metric addresses the remediation worker, as opposed to a collocated worker. In addition, the rating must consider the entire process, not just treatment exposure risks. Seven worker hazards were considered in developing the metric: (1) confined space entry, (2) radiological, (3) industrial, (4) potential fire/explosion, (5) hazardous chemical, (6) airborne contaminant, and (7) electrical hazard. As with some previous measures, a "complexity factor" was assigned to this measure to address the difficulty involved in mitigating some of the technology-specific hazards (see Figure 27).

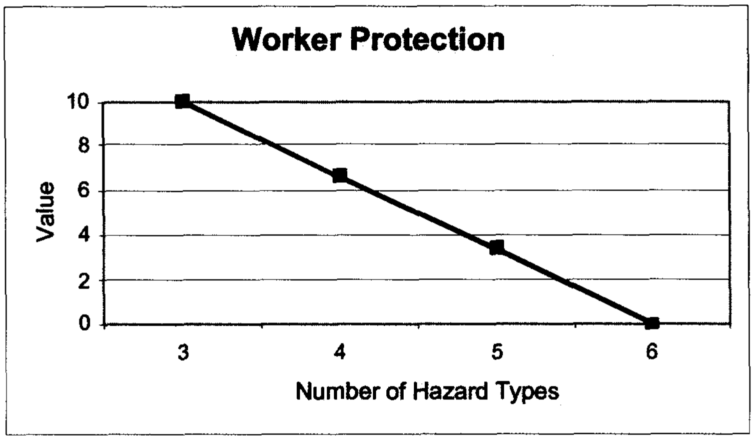


Figure 26. Worker protection.

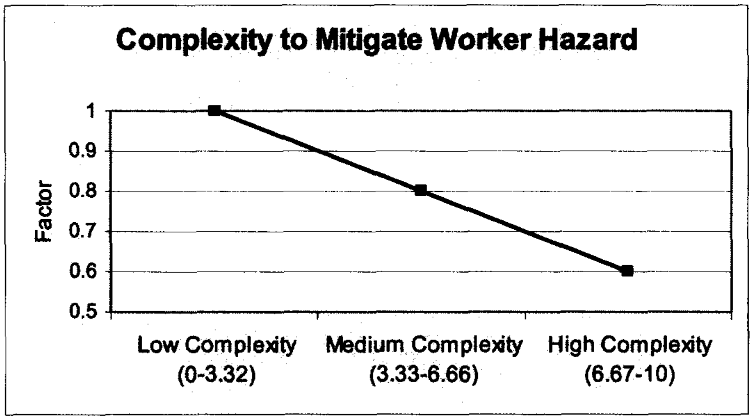


Figure 27. Complexity to mitigate worker hazard.

5.2.4 Environmental Impacts (40 CFR 300.430 [e][9][iii][E][3]) and (EPA/540/G-89/004, § 6–9)

This subcriterion satisfies the CERCLA requirement to address the potential for adverse environmental impacts that could result from the construction and implementation of a remedial alternative. It focuses on the most important issue—endangered species. The worst outcome is selecting an alternative that has an impact on endangered species. (It is assumed that all of the alternatives will have the same score [no impact] for V-Tank remediation, but the criterion is kept to show that it was considered.) The measure has two categories: (1) plants and (2) animals. Figure 28 shows the value function of the plant impact metric. Figure 29 shows the value function of the animal impact metric.

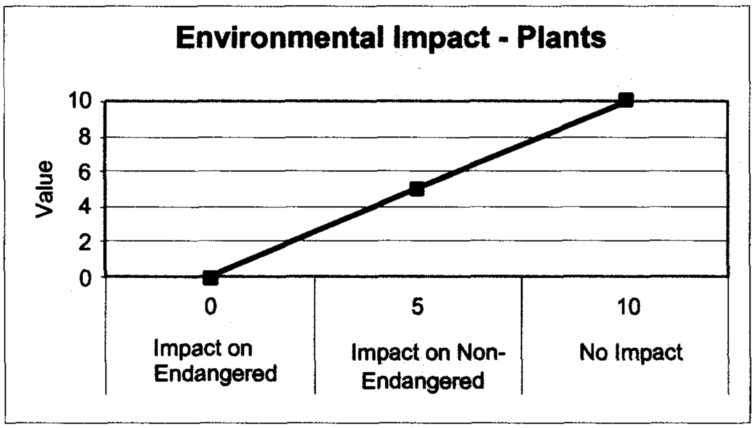


Figure 28. Environmental impact—plants.

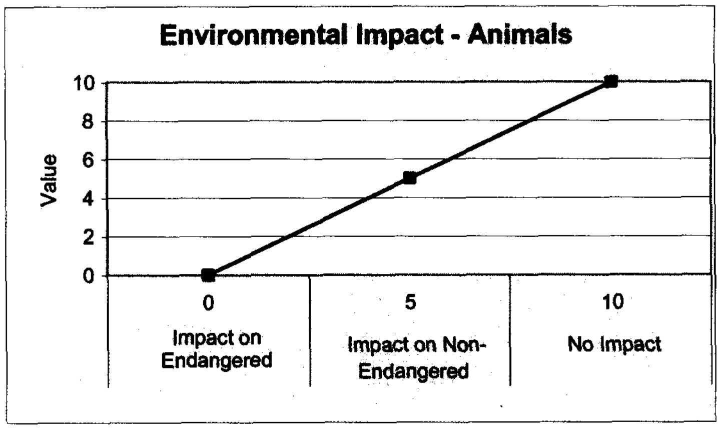


Figure 29. Environmental impact—animals.

5.3 Long-Term Effectiveness and Permanence (40 CFR 300.430 [e][9][iii][F]) and (EPA/540/G-89/004, § 6.2.3.3)

This criterion addresses the results of a remedial action in terms of the risk remaining at the site after response objectives have been met. The evaluation's primary focus is the extent and effectiveness of the controls that could be required to manage the risk posed by treatment residuals and/or untreated waste. The following subcriteria address the magnitude of residual risk and adequacy and reliability of controls.

5.3.1 Magnitude of Residual Risk (40 CFR 300.430 [e][9][iii][F][1]) and (EPA/540/G-89/004, § 6–8)

This subcriterion assesses the residual risk remaining from untreated waste or treatment residuals at the conclusion of remedial activities. The potential for this risk can be measured by numerical standards, such as cancer risk levels or the volume or concentration of contaminants in waste, media, or treatment residuals remaining on the site. The characteristics of the residuals should be considered to the degree that they remain hazardous, taking into account their volume, toxicity, mobility, and propensity to bioaccumulate. Figure 30 shows the value function for this metric. (Because each of the V-Tank remedial alternatives results in clean closure, this metric will not distinguish between alternatives.)

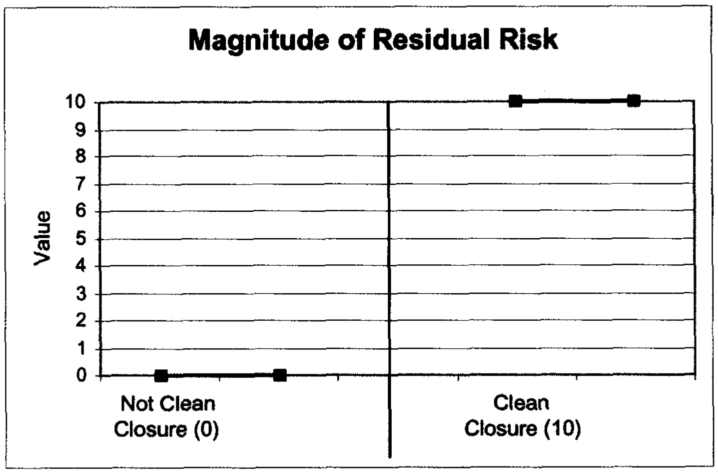


Figure 30. Magnitude of residual risk.

5.3.2 Adequacy and Reliability of Controls (40 CFR 300.430 [e][9][iii][C][2]) and (EPA/540/G-89/004, § 6–9)

The CERCLA guidance addresses the adequacy and reliability of controls used to manage treatment residuals or untreated waste that remains at the site. It also addresses the potential need for replacement of technical components, magnitude of threats or risks should the remedial action need replacement, and degree of confidence that controls adequately handle potential problems over the long term. Figure 31 shows the value function for this metric. (Again, because each alternative achieves clean closure, this metric will not distinguish between alternatives.)

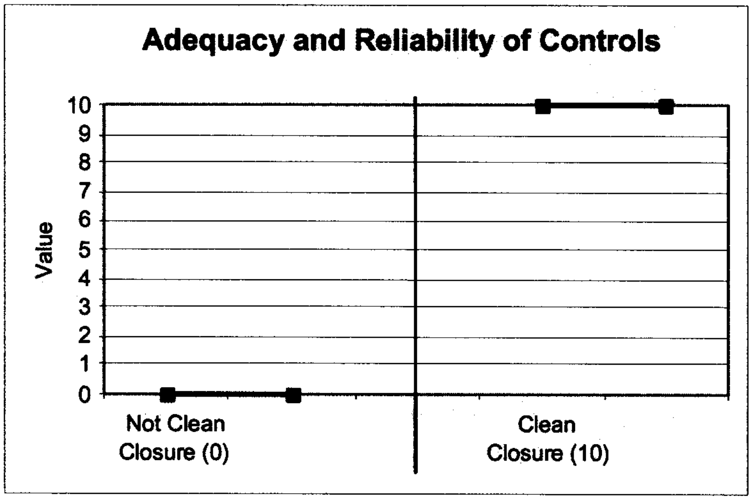


Figure 31. Adequacy and reliability of controls.

5.4 Reduction of Toxicity, Mobility, and Volume through Treatment (40 CFR 300.430 [e][9][iii][D]) and (EPA/540/G-89/004, § 6.2.3.4)

This criterion addresses the statutory preference for selecting remedial actions that employ treatment technologies that permanently and significantly reduce TMV of the hazardous substances.

Since the ROD directs removal of tank contents, the principal threat was considered to be Cs-137-contaminated soil surrounding the tanks. A formal risk assessment has been performed on the Cs-137-contaminated soil. The contaminants associated with tank contents will present no residual risk after removal and treatment for all alternatives being evaluated. However, it was determined that the tank content contaminants were an important evaluation consideration in terms of treatment and disposal. Based on a review of these contaminants and their fate during treatment and disposal, the following key CFTs were identified: (1) TRU, (2) cadmium, (3) lead, (4) mercury, (5) TCE, (6) PCBs, and (7) BEHP.

5.4.1 The Amount of Hazardous Materials Destroyed or Treated (40 CFR 300.430 [e][9][iii][D][3]) and (EPA/540/G-89/004, § 6.2.3.4)

This subcriterion satisfies the CERCLA requirement to address the amount of hazardous material destroyed or treated. It addresses primary treatment and primary waste volume only. There is a separate category for residual waste treatment (see Section 4.5.4).

Figure 32 shows the value function for primary waste volume. This volume measurement includes the treated contents of the tanks, the reagents or soil added during the treatment process, and the surrounding soil and tanks. Although separate metrics for each of these components could have been used, the soil and tank volumes generally are comparable across all alternatives and tend not to provide a clear means to distinguish among alternatives. However, for completeness, their volume is included in this metric.

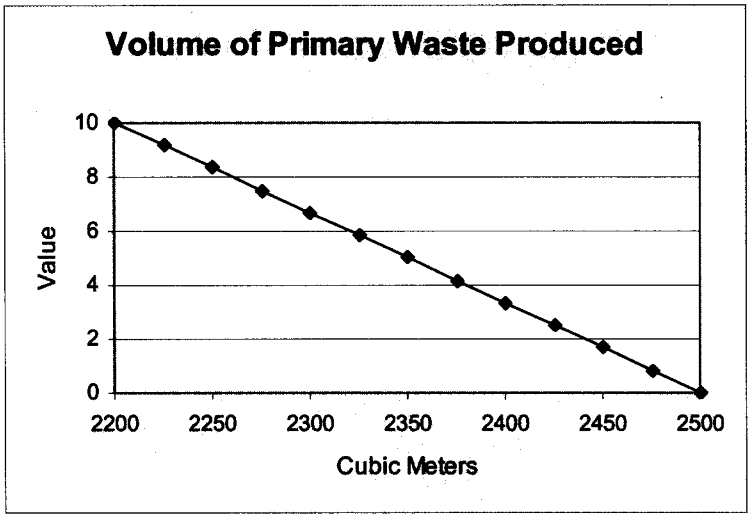


Figure 32. Volume of primary waste produced.

It is assumed that the concentration in the final waste form, after all necessary treatments, will be used to establish a CFT's final concentration. Based on samples of the tank contents, the V-Tank waste is assumed to be characteristically hazardous. This invokes applicable underlying hazardous constituents and the associated universal treatment standards (UTSs). (Note: Additional sampling could prove this assumption is in error.) Therefore, the following remediation goals were identified to meet regulatory limits and the waste acceptance criteria of the applicable disposal facility(ies):

- Transuranics—<10 nCi/g (ICDF waste acceptance criteria); 10–100 nCi/g (NTS or Hanford waste acceptance criteria); >100 nCi/g (WIPP waste acceptance criteria)
- Cadmium (TCLP)—0.11 mg/L (UTSs)
- Lead (TCLP)—0.75 mg/L (UTSs)
- Mercury (TCLP)—0.025 mg/L (UTSs)
- TCE—6 mg/kg (UTSs)
- PCBs—10 mg/kg (UTSs)
- BEHP—28 mg/kg (UTSs).

Figure 33 shows the metric's value function for the TRU concentration in the primary waste after all treatments. A TRU concentration less than 10 nCi/g was given a score of 10, since more disposal options are available and the TRU levels are reduced. The next best option is disposal at the WIPP, since it is operational and INEEL waste is already being shipped there. Thus, if waste were concentrated to greater than 100 nCi/g, it would receive a score of 9. Finally, if the concentration is between 10 and 100 nCi/g, the waste would receive a score varying from 8 to 9. This is based on the assumption that the NTS and Hanford will be accepting out-of-state mixed waste by 2007.

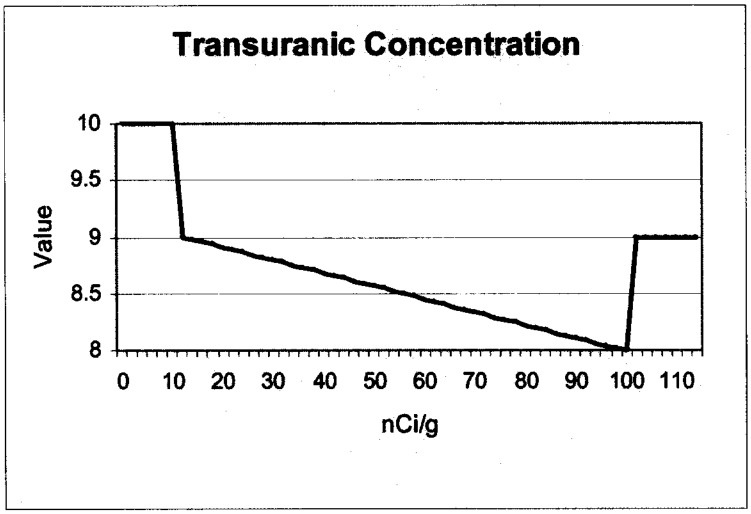


Figure 33. Transuranic concentration.

Figures 34–39 show the value functions for reduction in toxicity and/or mobility of cadmium, lead, mercury, TCE, PCBs, and BEHP. The scale for each value function metric is an inverse log scale, covering two orders of magnitude, with the lower scale defined as the LDR concentration (or leachate value) and the higher scale defined as 1% of the LDR concentration (or leachate value). The value functions chosen for these measures produce the following: (1) an output score of 10 (best) if the proposed technology system results in a TCLP or total concentration at least two orders of magnitude lower than the LDR limit; (2) an output score of 5 if the proposed technology results in a TCLP or total concentration one order of magnitude below LDR limits; and (3) an output score of 0 (worst) if the proposed technology is not expected to meet LDRs. Input values for each technology system were determined by estimating the resulting concentration (or leachate value) for each identified contaminant, following treatment.

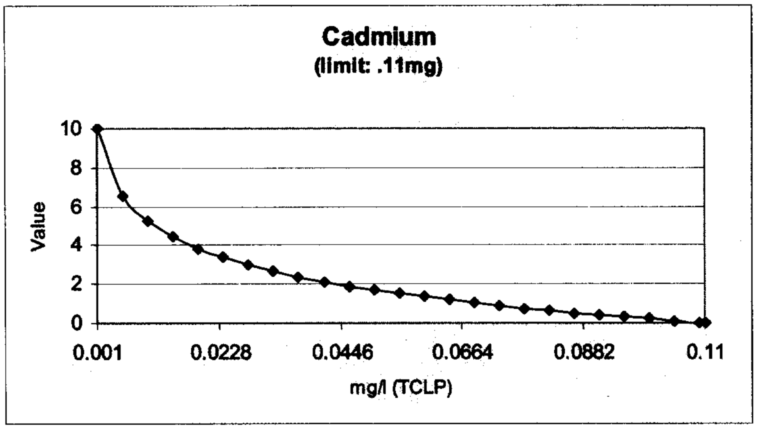


Figure 34. Cadmium.

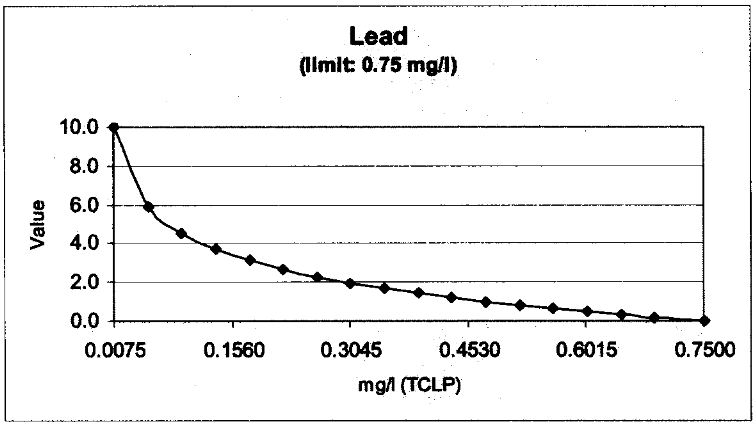


Figure 35. Lead.

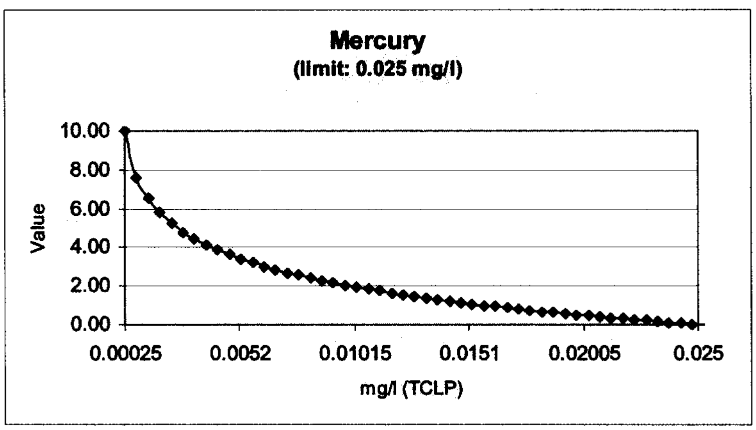


Figure 36. Mercury.

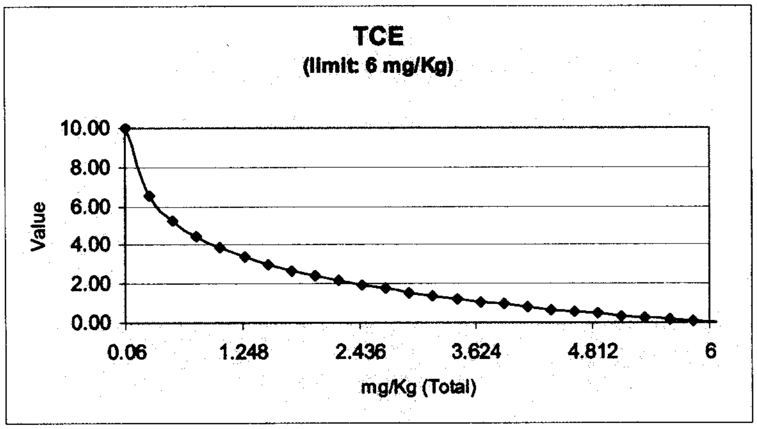


Figure 37. Trichloroethylene.

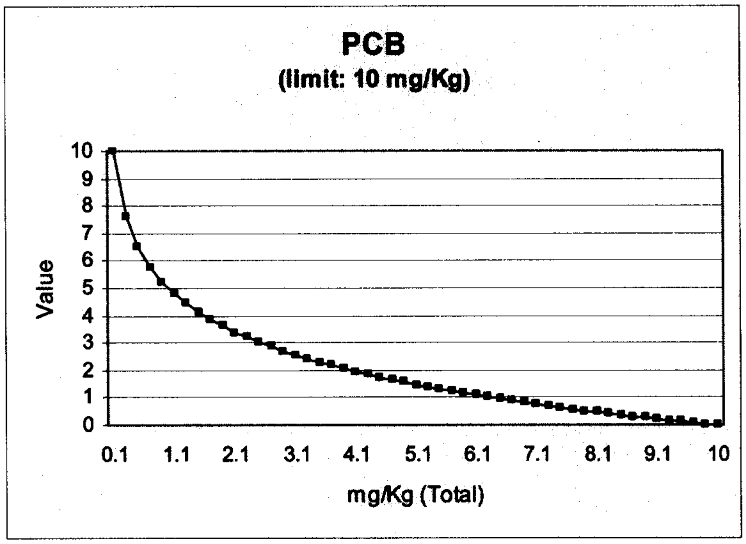


Figure 38. Polychlorinated biphenyl.

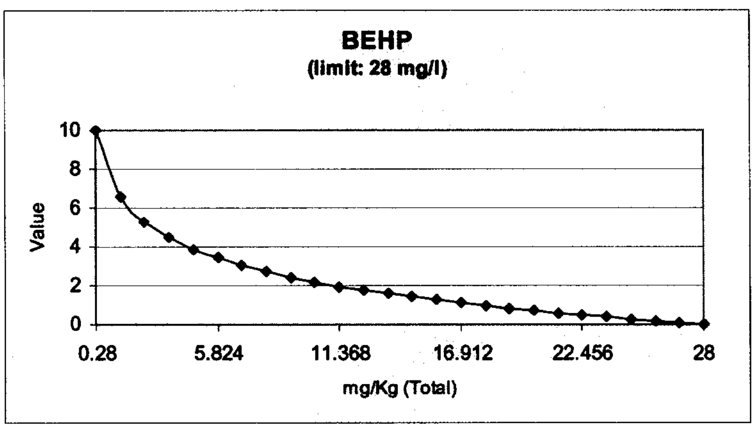


Figure 39. Bis(2-ethylhexyl)phthalate.

5.4.2 Amount of Principal Threat Treated to Reduce Toxicity, Mobility, or Volume (40 CFR 300.430 [e][9][iii][D][3]) and (EPA/540/G-89/004, § 6.2.3.4)

This subcriterion satisfies the CERCLA requirement to address the degree of expected reduction in TMV of the principal threat (Cs-137) in the soil surrounding the tanks. The final remediation goal for Cs-137 is 23.3 pCi/g. If levels above this limit are found during soil removal at depths that provide a credible pathway to potential receptors, additional soil will be removed until this limit is achieved. Figure 40 shows the value function for this metric. (Since all alternatives for the V-Tanks will result in clean closure, this subcriterion will not distinguish between alternatives.)

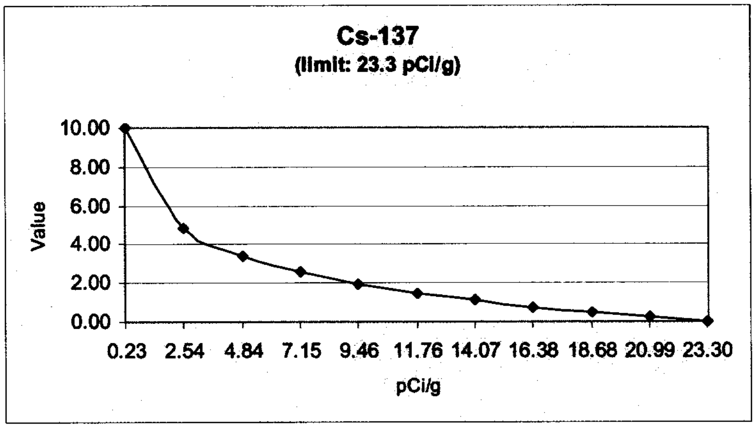


Figure 40. Cesium-137.

5.4.3 Irreversibility of Treatment of Contaminants (40 CFR 300.430 [e][9][iii][D][3]) and (EPA/540/G-89/004, § 6.2.3.4)

This subcriterion satisfies the CERCLA requirement to address the irreversibility of the reduction in contaminant mobility and toxicity. For these alternatives, reversing toxicity is not applicable. This evaluation measure focuses on the mobility's reversibility (in the form of leachability) of the treated waste due to natural degradation. Figure 41 shows the value function for this metric.

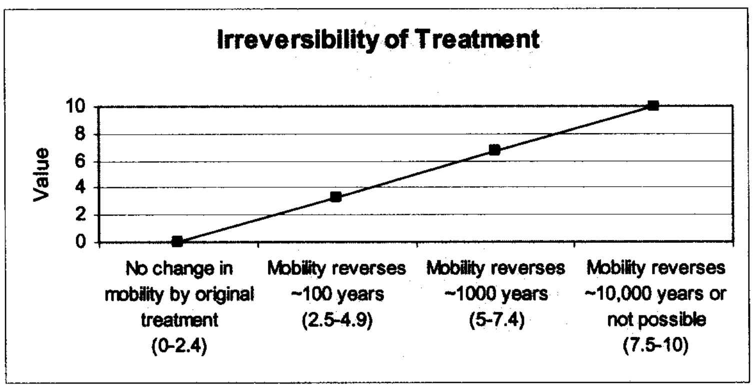


Figure 41. Irreversibility of treatment.

5.4.4 Amount of Treatment Residuals Remaining after Treatment (40 CFR 300.430 [e][9][iii][D][3]) and (EPA/540/G-89/004, § 6.2.3.4).

This subcriterion satisfies the CERCLA requirement to address the quantity and characteristics of treatment residuals (secondary waste). Included in this category are the following waste types: contaminated equipment, spent filters, used personal protective equipment, etc. For the V-Tanks, the Agencies agreed at a meeting held on August 26, 2002, to only look at the volume of secondary waste, not the characteristics. Although the characteristics may vary somewhat between alternatives, the waste volume was considered the key metric and other criterion (such as disposal costs) would tend to address the contaminant treatment and disposal issues. Figure 42 shows the value function for this metric.

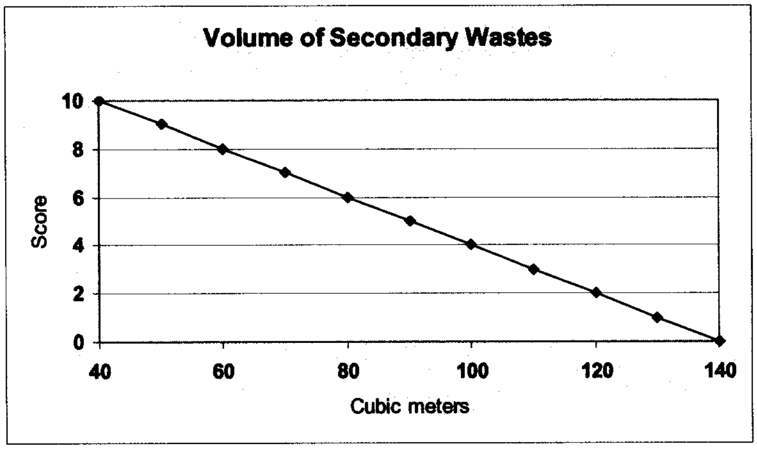


Figure 42. Volume of secondary waste.

5.5 Cost

The CERCLA (42 USC § 9601 et seq.) and 40 CFR 300.430 (e)(9)(iii)(G) state that this criterion must account for capital cost, operations and management cost, and present worth (EPA 1998). For this metric, life-cycle costs (without escalation) were discounted to net present value.

Cost is defined for the life cycle of the entire V-Tank Project. This includes costs for treatment, transportation, storage, and disposal. The costs include primary treatment, soil remediation and removal, pipe removal, tank removal, processing of secondary waste, sampling and analysis, interim storage, shipping, disposal, site restoration, safety analysis, work authorization, contingency, and other associated costs. Historical costs incurred to date since issuance of the original ROD also are included. As illustrated in Figure 43, the value function for cost assigns the lowest value to the highest life-cycle cost alternative.

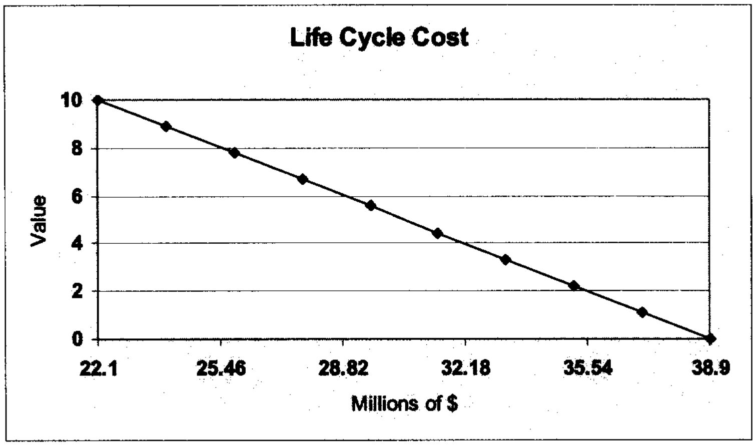


Figure 43. Life-cycle cost.

5.6 Applicability to Other Idaho National Engineering and Environmental Laboratory Comprehensive, Environmental Response, Compensation, and Liability Act Waste Streams

This criterion is not part of the formal CERCLA process, but was included in the V-Tanks' analysis as an efficiency measure endorsed by the Agencies. Typically, the CERCLA process is applied at a specific site, and it does not consider ramifications to other sites. At the INEEL, there are many CERCLA sites, and each is nominally considered separately. The DOE-ID, EPA, and IDEQ want to be proactive in evaluating potential efficiencies for the INEEL. Thus, a criterion was added to this evaluation to assess whether the treatment alternative for the V-Tanks could have potential applicability toward other INEEL CERCLA waste streams.

Three CERCLA waste streams were identified that could potentially be treated in the same manner as V-Tank waste. These waste streams include waste from a tank at the Auxiliary Reactor Area (ARA), ARA-16; the PM-2A tanks at TAN; and investigation-derived waste from previous CERCLA work at TAN.

The ARA-16 tank was a 1,000-gal stainless-steel underground holding tank resting within a concrete vault and covered by approximately 3.5 ft of soil. From 1959 to 1988, the tank received radioactive liquid waste, including wash water from hot cells, methanol, acetone, chlorinated paraffin, and mixed acids from material testing and research and metal-etching processes. Periodically, the contents of the tank were emptied into a tank truck and transported to INTEC (formerly known as the Idaho Chemical Processing Plant) for disposal on an as-needed basis.

The ARA-16 facility was formally shut down in 1988, and the tank was partially excavated. All lines into and out of the tank were later cut and capped, and the tanks' contents were agitated and pumped out through a sludge high-integrity container (with internal filter) to separate the liquid and solid phases. The liquid has been treated and is planned for disposal at the ICDF. However, the sludge phase (representing less than 100 gal) remains untreated. It also was destined for treatment and disposal at the ATG. Through sampling results and anecdotal information, the waste was identified as containing F-listed mixed waste along with TRU elements (DOE-ID 1999b).

The PM-2A tank site (TSF-26) at TAN consists of two abandoned 50,000-gal underground storage tanks and the contaminated surface soil around them. The total waste volume currently in these tanks is estimated to be 8,000 gal. The tanks are approximately 15 ft below ground surface and rest in concrete cradles. The tanks were installed in the mid-1950s and stored concentrated low-level radioactive waste from the TAN-616 evaporator from 1955–1981. Currently, the tanks contain sludge contaminated with radionuclides, heavy metals, organic compounds, and PCBs. These tanks' primary sludge source was from the V-Tanks that collected this waste from various TAN sources. No liquids are present in the PM-2A tanks, because, in 1981, the tanks were partially filled with material to absorb free liquid (DOE-ID 1999a).

Investigation-derived waste includes items such as used equipment, glass, personal protective equipment (PPE), and sample residue directly associated with V-Tank activities. The gross volume of this waste is 924 ft^3. The majority of this waste is stored at TAN in CERCLA storage areas, but there are also containers of this waste stored in RCRA-permitted storage facilities at the Waste Reduction Operations Complex. The waste is containerized in a variety of drums and wooden boxes.

Currently, there are four other CERCLA-managed waste streams associated with other Waste Area Group 1 waste activities at TAN, in addition to the V-Tank investigation-derived waste. The gross volume of this investigation-derived waste is 625 ft^3. The waste is composed of soil, PPE, and other debris generated from sampling activities at various Waste Area Group 1 locations. This waste is stored at TAN in CERCLA storage areas and at the Waste Reduction Operations Complex and INTEC in RCRA-permitted storage facilities. The waste is containerized in a variety of drums and wooden boxes.

Figures 44, 45, and 46 show the value functions used to rate the alternatives for applicability to treatment of other waste. Each waste stream is considered to have equal weighting. All three value functions are differentiated based on whether the alternative cannot be used for the waste stream, can be used but some adaptation of the technology is required, or can be easily adapted for use on that waste stream.

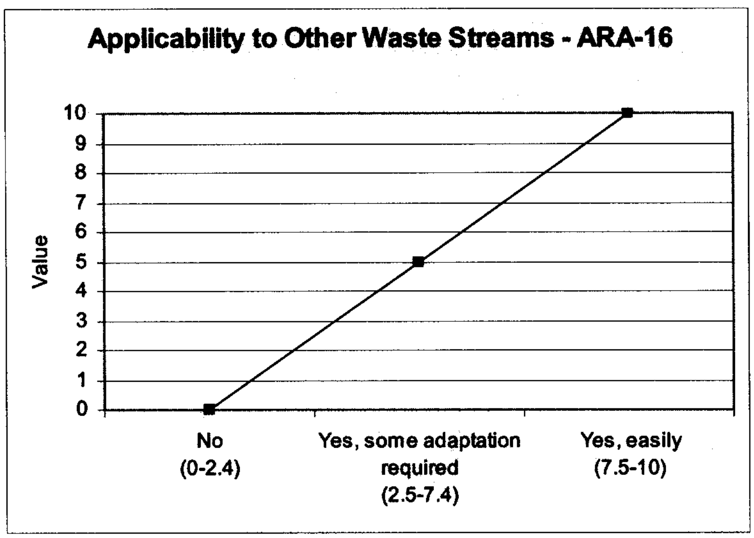


Figure 44. Applicability to other waste streams—ARA-16.

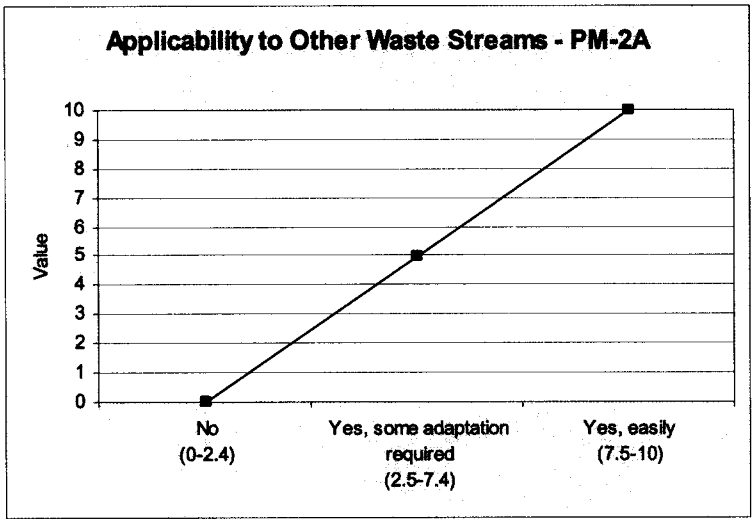


Figure 45. Applicability to other waste streams—PM-2A.

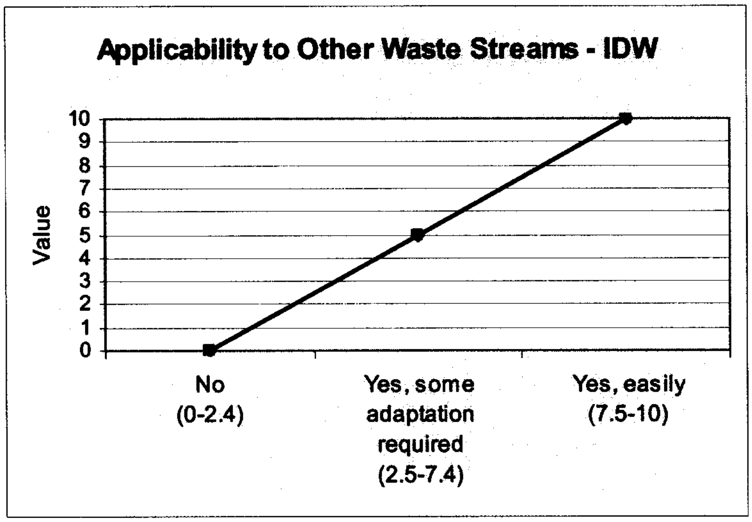


Figure 46. Applicability to other waste streams—investigation-derived waste.

After setting the criteria as outlined in Sections 4.2 through 4.7, the Agencies assigned a weighting factor to each criterion. These are shown in Figures 47 and 48. The first chart (Figure 47) shows how each of the main criteria is weighted (e.g., 33% of the decision is based on implementability of the remedial alternative). Figure 48 illustrates the flow down or distribution of weight across subcriteria that are used to evaluate implementability (e.g., technical feasibility makes up 40% of the implementability criterion) and are broken up further into yet another level of detail. Then, each criterion is evaluated at the greatest level of detail, and the weights are applied at each level to result in an overall evaluation of each remedial alternative. A detailed breakdown of the criteria weights is included in Appendix B.

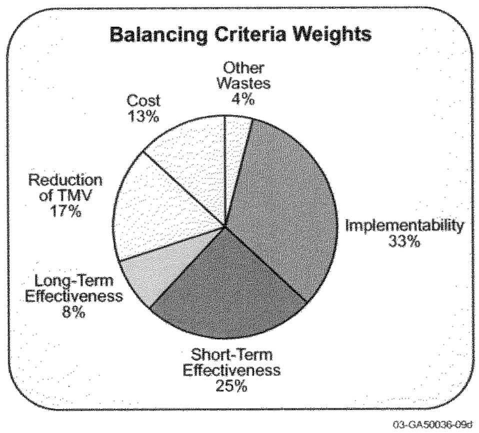


Figure 47. Pie chart for balancing criteria weighting factors.

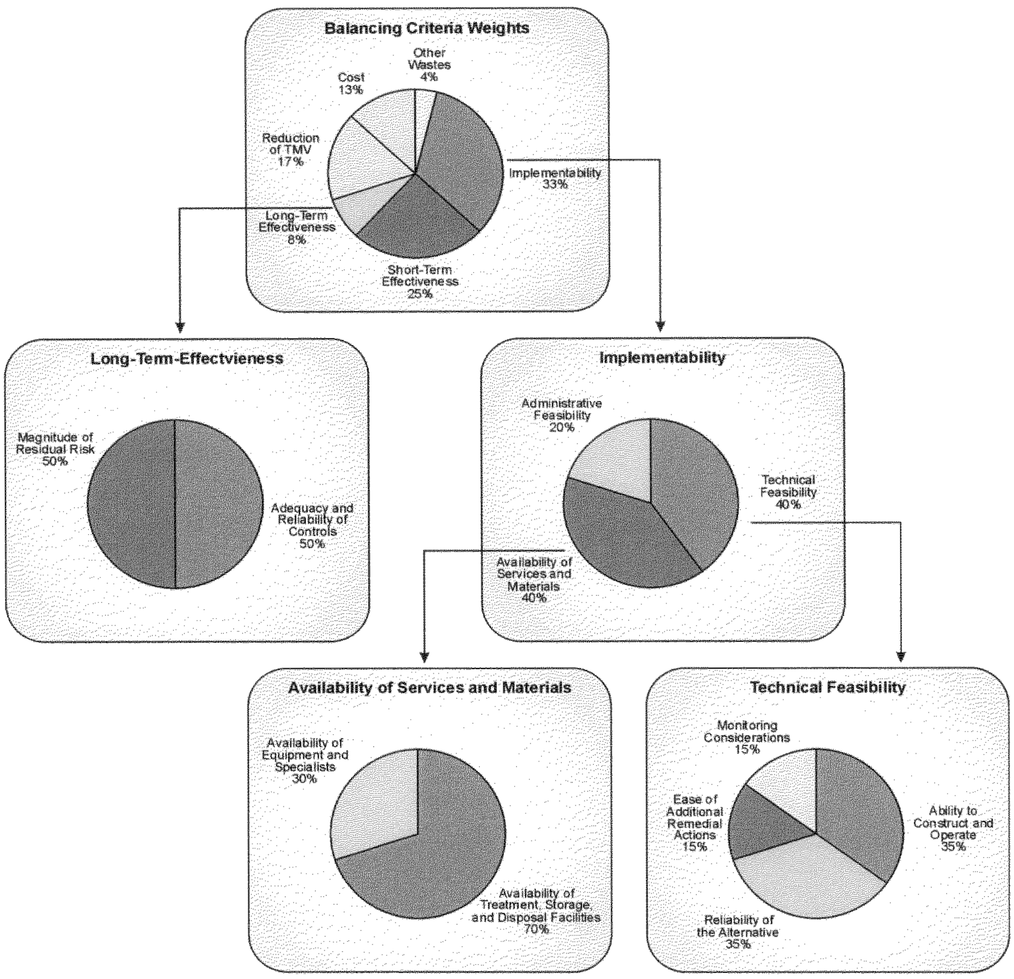


Figure 48. Flow down for criteria weighting factors.

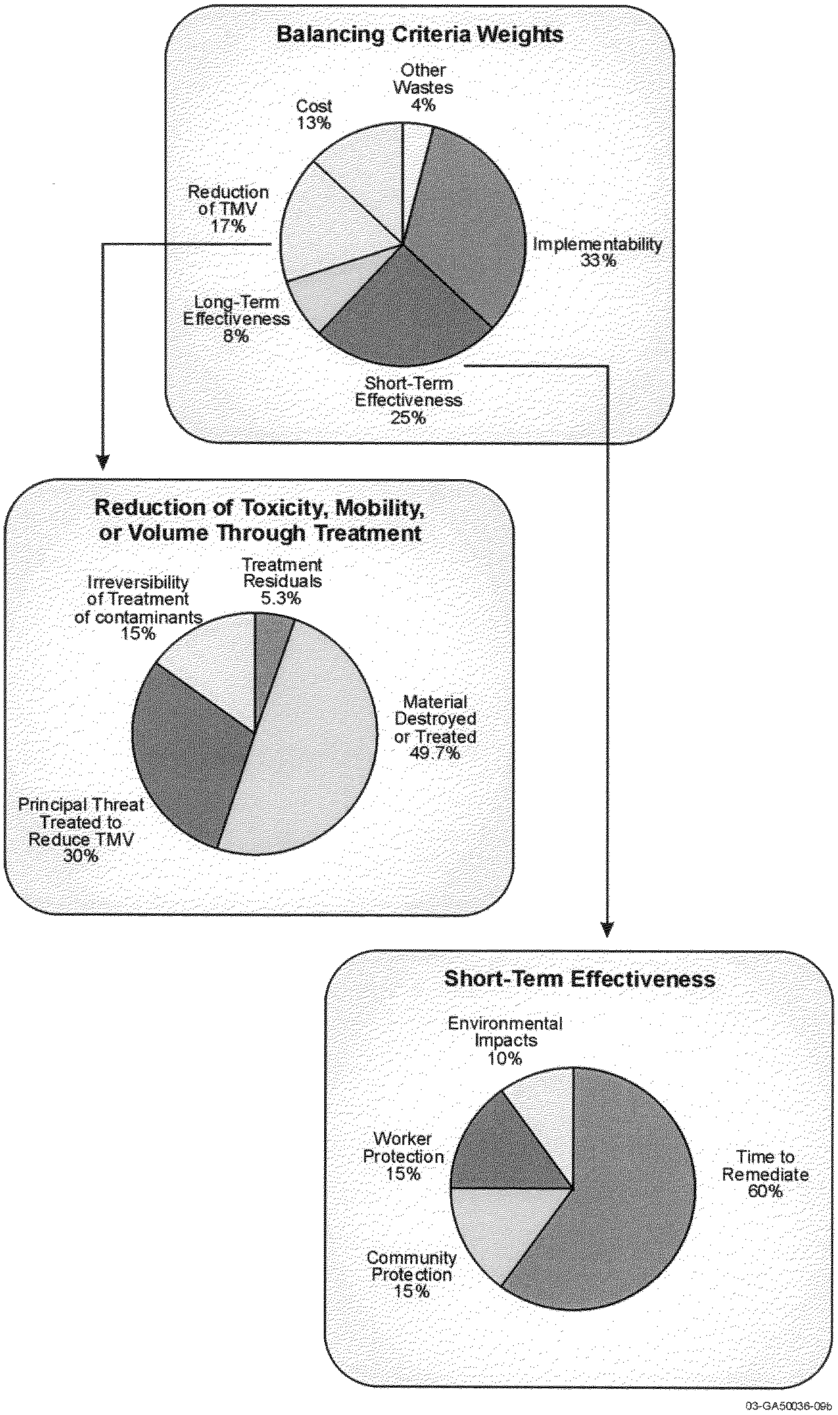


Figure 48. (continued).

The next step in performing the technology evaluation is determining the alternatives' performance against the value functions and then determining the overall score for an alternative by summing the scores for each subcriterion.

5.7 Evaluation Model

As indicated, a previous decision support model was modified to facilitate objective selection of the preferred alternative for the V-Tanks. The model includes quantitative weighting factors and value functions for the various criteria, which were derived from a consensus meeting with the three Agencies on August 26, 2002. The Agencies collectively decided which criteria to include under the CERCLA guidance, how each of the criteria would be weighted, and how the range of values for the criteria would be scored. Details on the weighting factors and the value functions for each of the individual subcriteria are included in Appendix B. A detailed description of the model, including the validation process, is documented in the "V-Tanks Decision Support Model Design Report (Draft)."[c]

5.8 Assessment of Alternatives against Comprehensive Environmental Response, Compensation, and Liability Act Criteria

Table 17 provides a comparative analysis of the seven alternatives against each of the CERCLA criteria outlined above. The table is structured around the criteria, and it includes the value functions (graphs), the input parameter (x-axis) assigned for each alternative, and the associated justification. The numerical value of the input parameter was obtained through consensus by a group of INEEL experts across various disciplines. These input parameters were provided to the V-Tank Decision Support Model (see footnote c) that converted these parameters, through the value functions, to an output value for each alternative and for each criterion. Then, the output values were multiplied by the weighting factors assigned by the Agencies to generate a score. Each of the scores for the criteria was summed to generate a final score for each alternative. The scores are summarized in Section 5. Detailed output from the model is provided in Appendix C.

c. INEEL, 2002b, "V-Tanks Decision Support Model Design Report (Draft)," INEEL/EXT-02-01448, Idaho National Engineering and Environmental Laboratory, Idaho Falls, Idaho, November 2002.

Table 17. Comparative assessment of alternatives against each Comprehensive Environmental Response, Compensation, and Liability Act criterion.

Criterion	Alternative Number	Alternative	Input Parameter	Justification
4.2 Implementability				
4.2.1 Technical Feasibility				
4.2.1.1 Ability to Construct and Operate *(State of the Technology)* Scale: Research: 0–1.9 Development: 2–3.9 Demonstration: 4–5.9 Used in similar applications: 6–7.9 Used routinely: 8–10 This subcriterion focuses on the maturity of the technology.	1 2 3 4 5 6 7	*ISV* *ESV* *TD on/off-Site* *TD on-Site* *TD off-Site* *IS-CO/S* *ES-CO/S*	7 6 6 6 4–5 3 5	Planar ISV has been used in similar applications at the Los Alamos National Laboratory and the Oak Ridge National Laboratory. In addition, a simulated demonstration was completed at DOE's Hanford Site. Planar ISV operations also have been conducted in Australia and Japan. Therefore, ISV is judged to be used in similar applications. While similar technologies have been used, ESV has not been deployed using portable systems within the DOE complex. Large-scale, stationary vitrification plants have been operated at West Valley, and one is currently operating at the Savannah River Site. Another ESV system is in final design at the Hanford Site. Therefore, ESV is judged between demonstrations and used in similar applications. Similarly, the TD on/off-Site and TD on-Site alternatives use a technology that is currently used in similar applications; however, these are judged equivalent to ESV due to the lack of experience in a radiological environment. The TD off-Site alternative, however, is judged to be in the demonstration phase due to the lack of soil feed to the TD unit and the associated increase of radiological issues. Treatability studies have been completed for CO/S of actual V-Tank waste. The IS-CO/S is in the development phase, since considerable technical uncertainties remain, such as corrosion and the ability to maintain temperature control. Some commercial applications currently exist for ES-CO/S. In addition, there are planned DOE applications at the Oak Ridge National Laboratory and Savannah River Site. Therefore, ES-CO/S is judged to be in the demonstration phase.

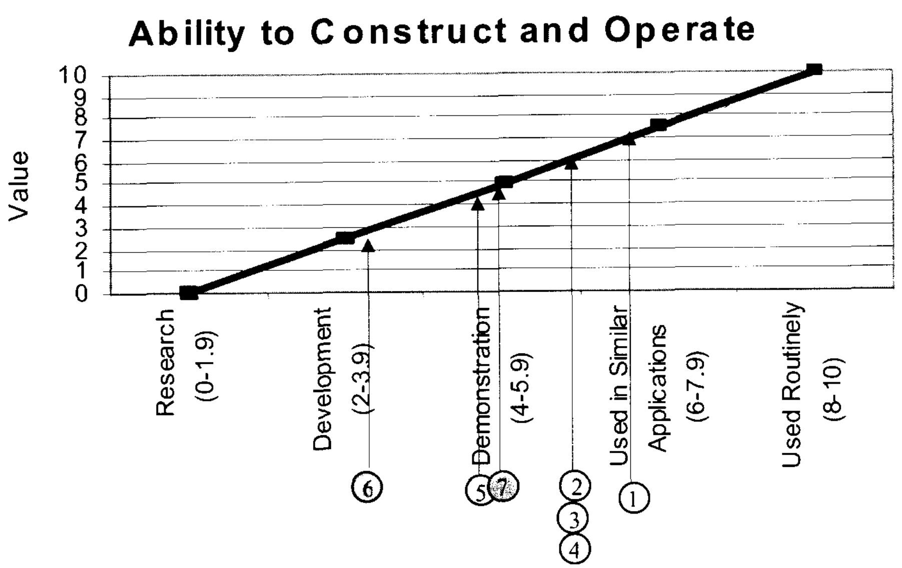
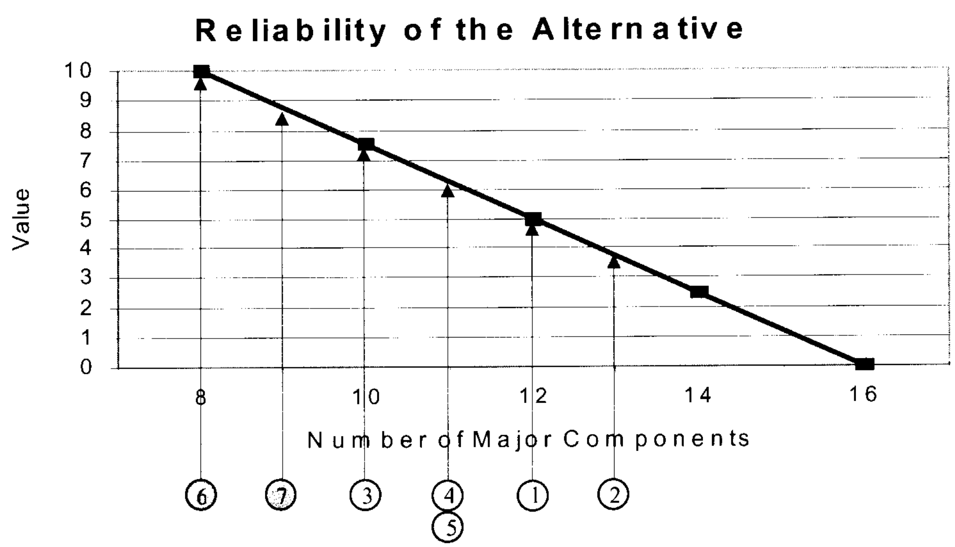


Table 17. (continued).

Criterion	Alternative Number	Alternative	Input Parameter	Justification
4.2.1.2 Reliability of the Alternative *(Number of Major Components)* Scale: 8–16 This subcriterion addresses the likelihood that technical problems associated with implementation will lead to schedule delays.	1 2 3 4 5 6 7	*ISV* *ESV* *TD on/off-Site* *TD on-Site* *TD off-Site* *IS-CO/S* *ES-CO/S*	12 13 10 11 11 8 9	The input parameter represents the major process components for each alternative. The "major components" generally correspond to those unit operations identified on the process flow diagrams, with certain lesser units combined (e.g., condensers and demisters). Furthermore, the additional shielding required for ex situ operations was credited as an additional component.



Criterion	Alternative Number	Alternative	Input Parameter	Justification
4.2.1.3 Ease of Additional Remedial Action Scale: Abandon technology: 0–2.9 Adjust technology: 3–6.9 Immediate recovery: 7–10 This subcriterion addresses future remedial actions that might need to be undertaken and how difficult it would be to implement such additional actions (i.e., recovery).	1 2 3 4 5 6 7	*ISV* *ESV* *TD on/off-Site* *TD on-Site* *TD off-Site* *IS-CO/S* *ES-CO/S*	4 5 6 7 6 7 8	In situ vitrification is clearly the most difficult to recover from noncompliant final waste forms or severe process anomalies, but this shortcoming does not require complete abandonment of the technology. For example, if the glassified waste form does not meet the ICDF's disposal requirements, it must first be cooled and another starter path installed before repeating the vitrification process. Ex situ vitrification is less complicated to recover from process anomalies than ISV, but more complicated than the other technologies. All of the TD and CO/S alternatives have intermediate steps that allow corrective action before generation of the final waste form. However, in the case of TD, this recovery step involves recycling the product to the TD unit, which is a relatively complicated operation. In addition, off-Site shipment issues associated with the TD on/off-Site and TD off-Site alternatives generally are more difficult to prepare for and recover from, particularly if the waste is found noncompliant upon receipt and before treatment or disposal. If the oxidation/reduction process was not completely effective, immediate recovery is possible since the same steps can simply be repeated, but perhaps for a slightly longer duration or at higher temperatures. This recovery also will be easier for ES-CO/S than IS-CO/S, due to improved process control (e.g., temperature). For example, an alternative to insufficient oxidation of TCE is to evaporate it and collect it on the GAC bed. However, this approach would not work for SVOCs, some of which could require a 90% + DRE. Therefore, the CO/S alternatives did not receive maximum scores.

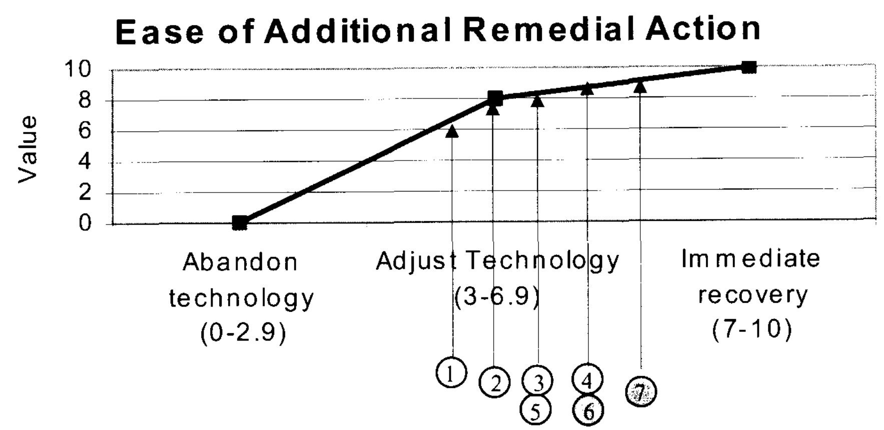
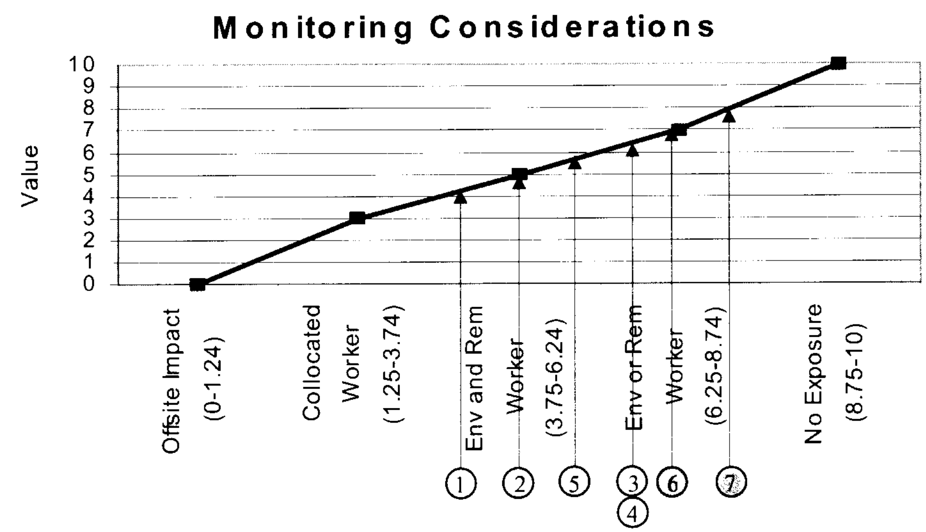


Table 17. (continued).

Criterion	Alternative Number	Alternative	Input Parameter	Justification
4.2.1.4 Ability to Monitor the Effectiveness of the Remedy Scale: Off-Site impact: 0–1.24 Collocated worker: 1.25–3.74 Environment and remediation worker: 3.75–6.24 Environment or remediation worker: 6.25–8.74 No exposure: 8.75–10 This subcriterion addresses the possible consequences, in terms of exposure to hazards, that a failure to effectively monitor the performance of the remedy could have on people or the environment.	1 2 3 4 5 6 7	*ISV* *ESV* *TD on/off-Site* *TD on-Site* *TD off-Site* *IS-CO/S* *ES-CO/S*	4 5 7 7 6 7.5 8.5	Without sufficient monitoring, risks directly correlate to the energy input into the system (i.e., the greater the energy input, the higher the risk). When considering accident scenarios, it appears the vitrification alternatives pose a potential for environmental and remediation worker exposure, but no realistic impact to even a collocated worker. Ex situ vitrification has slightly less risk than ISV, due to increased process control. The TD alternatives generate a thermally hot, dusty-type residue, which can be contained, but has the potential for remediation worker exposure during certain material-handling operations. The higher radiation fields associated with TD off-Site constitute higher risk than the other TD alternatives. For IS-CO/S, a potential risk exists to the environment due to uncertainty of tank integrity during the oxidation step (i.e., chloride pitting of stainless steel). Finally, ES-CO/S appears to pose the lowest risk, due to the low temperatures and controlled environment, although risk is not totally eliminated.



Criterion	Alternative Number	Alternative	Input Parameter	Justification
4.2.2 Administrative Feasibility				
Number and Complexity of Required Administrative Process Approvals Administrative Approval Scale: 0–5 Complexity Scale: 0–1, 0.25 increments Note: Input is obtained by adding up the complexities for safety documentation, operational readiness, Hg retort alternative (Hg), PCB destruction alternative (PCB), and off-Site disposal.			(SD+OR+Hg+PCB+OD=TOTAL)	
	1	*ISV*	1 + 0.5 + 0.25 + 0.25 + 0 = 2	In situ vitrification has historically had significant SD complexity. Its previous applications warrant a moderate OR ranking. In situ vitrification needs alternate treatment standard acceptance and a TSCA risk-based petition for both Hg retort and PCB destruction, respectively. However, both are of minor complexity. The primary waste is disposed of on-Site. For all other alternatives, expect thermal desorption off-Site.
	2	*ESV*	0.75 + 0.75 + 0.25 + 0.25 + 0 = 2	Ex situ vitrification has slightly less SD complexity than ISV due to its ex situ nature. However, it is less developed, thereby increasing OR ranking. Like ISV, regulatory approvals are of minor complexity.
	3	*TD on/off-Site*	0.5 + 0.25 + 0 + 0 + 0 = .75	Thermal desorption on/off-Site has moderate SD complexity and minor OR complexity due to its ex situ nature, smaller number of components, and lack of a TO. It meets Hg retort and PCB destruction requirements.
	4	*TD on-Site*	0.75 + 1 + 0 + 0.25 + 0 = 2	On-Site TD uses a TO to treat the organic contaminants. This raises SD complexity to major and OR complexity to extreme. It meets Hg retort requirements, but requires minor regulatory approvals for PCB destruction using a TO.
	5	*TD off-Site*	0.5 + .75 + 0 + 0 + 1 = 2.25	Off-Site TD is expected to have moderate SD complexity and major OR complexity due to its potential for high-radiation exposures. It meets Hg retort and PCB destruction requirements. It requires off-Site disposal of the treated primary waste stream to facilities currently not accepting this type of waste. This is further complicated by its unknown status as TRU or non-TRU waste.
	6	*IS-CO/S*	0.75 + 0.5 + 0.5 + 0.5 + 0 = 2.25	The IS-CO/S has major SD complexity and moderate OR complexity due to its in situ design and operational uncertainties. Regulatory approvals for Hg retort and PCB destruction are more complex, since they differ from approved thermal processes. The primary waste is disposed of on-Site.
	7	*ES-CO/S*	0.5 + 0.25 + 0.5 + 0.5 + 0 = 1.75	The ES-CO/S is expected to have moderate SD complexity and minor OR complexity due to its ex situ nature and simpler design and operation. Regulatory approvals for Hg retort and PCB destruction are equivalent to IS-CO/S (moderate).

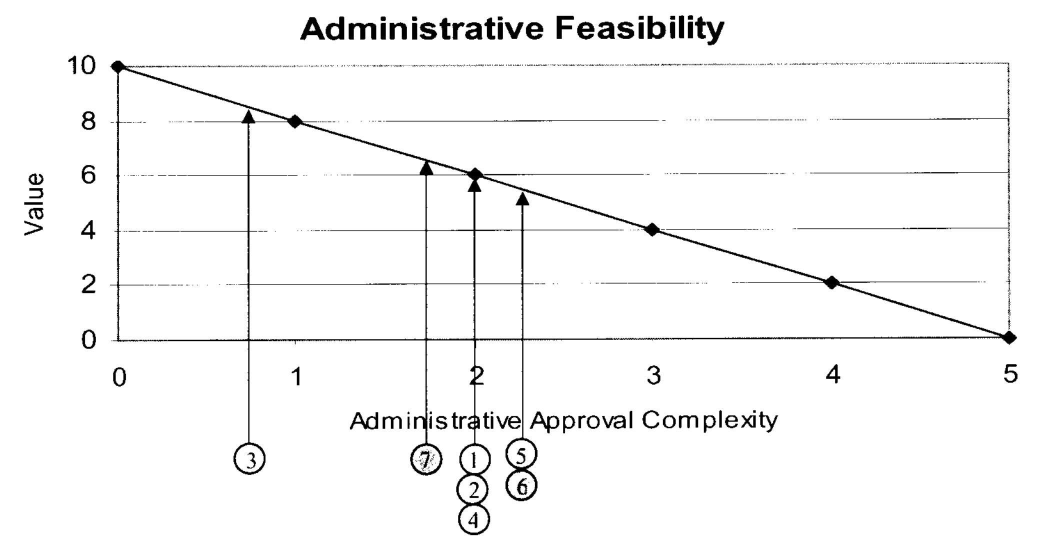
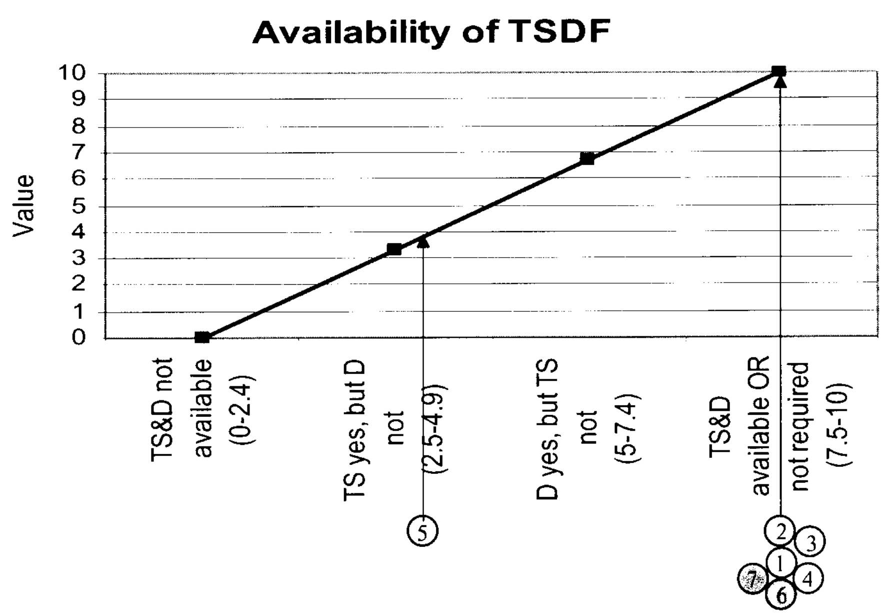


Table 17. (continued).

Criterion	Alternative Number	Alternative	Input Parameter	Justification
4.2.3 Availability of Services and Materials				
4.2.3.1 Availability of Treatment, Storage, and Disposal Facilities Scale: TS&D not available: 0–2.4 TS available, but D not: 2.5–4.9 D available, but TS not: 5–7.4 TS&D available OR not required: 7.5–10 This subcriterion addresses the availability of services, such as treatment, storage capacity, and disposal.	1 2 3 4 5 6 7	*ISV* *ESV* *TD on/off-Site* *TD on-Site* *TD off-Site* *IS-CO/S* *ES-CO/S*	10 10 10 10 3.75 10 10	All alternatives, with the exception of off-Site TD, have identified TSDFs that can immediately accept the associated waste streams from each process. (This assumes the ICDF is approved for disposal.) Off-Site TD has an identified disposal facility if the waste is classified as TRU waste (>100 nCi/g), but not if the TRU concentration in the waste is between 10–100 nCi/g. This option would require on-Site storage until the off-Site disposal facility is ready to accept the waste. (Note: The WIPP is approved for remote-handled waste, but it does not plan to accept this waste for several years. Furthermore, the V-Tank waste must be approved and added to the authorized inventory. Currently, Nevada and Washington are not accepting out-of-state mixed waste.) Note: Soil disposal was excluded, since all alternatives dispose of the soil to the ICDF.



Criterion	Alternative Number	Alternative	Input Parameter	Justification
INEEL Control Factor (for TSDFs): Scale: Neither TS nor D: 0 3.32 TS or D: 3.33–6.66 TS & D: 6.67–10 This factor addresses whether the INEEL is in control of the TSDF.	1 2 3 4 5 6 7	*ISV* *ESV* *TD on/off-Site* *TD on-Site* *TD off-Site* *IS-CO/S* *ES-CO/S*	7.5 7.5 5 10 0 7.5 7.5	The vitrification and CO/S alternatives produce only one waste stream requiring off-Site disposal: the GAC filter. (The ICDF cannot accept GAC filters that do not meet LDRs.) The remaining waste from these four alternatives can be disposed of at the ICDF, including SGAC filters. The TD on/off-Site alternative requires disposal of the off-gas waste products off-Site (condensate and GAC filters), but all other waste can be disposed of on-Site. The TD on-Site alternative can dispose of all its waste at the ICDF. The TD off-Site alternative disposes of the majority of its waste off-Site.

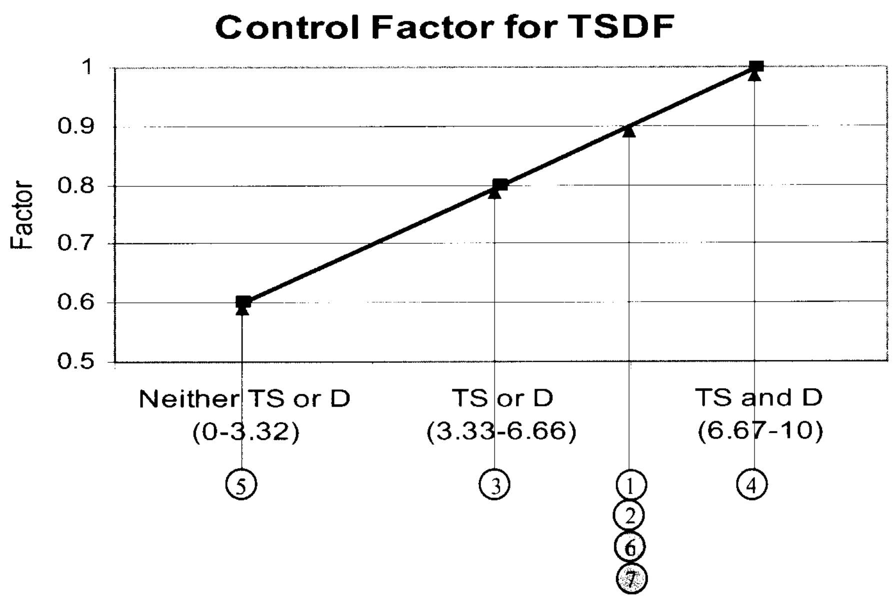
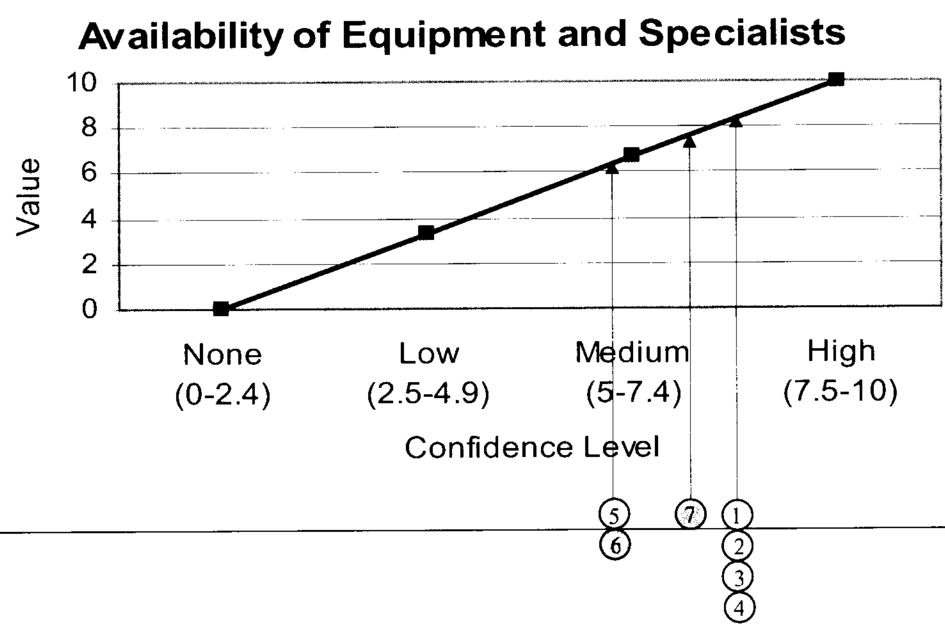


Table 17. (continued).

Criterion	Alternative Number	Alternative	Input Parameter	Justification
4.2.3.2 Availability of Equipment and Specialists (*Confidence Level*) Scale: None: 0–2.4 Low: 2.5–4.9 Medium: 5–7.4 High: 7.5–10 This subcriterion addresses the availability of equipment and specialists for each alternative.	1 2 3 4 5 6 7	*ISV* *ESV* *TD on/off-Site* *TD on-Site* *TD off-Site* *IS-CO/S* *ES-CO/S*	7.5 7.5 7.5 7.5 6 6 7	In situ vitrification only has one known vendor with any application/demonstration experience. Ex situ vitrification appears to have at least two viable vendors, but they lack direct experience with portable systems. The DOE complex has considerable experience with vitrification, but generally not with portable-type units, as planned for the V-Tanks. Therefore, a medium–high confidence level is assigned. On/off-Site TD and on-Site TD vendors appear to have significant experience and expertise with operation of TD units in nonradiological environments. In addition, they appear to have identified the necessary expertise to solve associated challenges for operation of these units in the low radiological environment that will exist with these two alternatives, due to the addition of soil to the TD unit. Therefore, a medium–high confidence level is assigned. Off-Site TD produces a waste stream with significantly higher radiation fields than all other alternatives, and it requires operation of the TD unit without soil addition. These factors are judged to reduce confidence in the availability of the necessary expertise to medium. Similarly, IS-CO/S has several technical uncertainties (as discussed earlier) and is judged medium. The ES-CO/S lacks vendors with experience in DOE applications. However, the process is not complicated, provided an adequate oxidant can be found, which appears likely. Furthermore, in the event that insufficient oxidation does occur, the reaction vessel can be used to evaporate VOCs, such as TCE and PCE, and collect these constituents on a GAC filter for disposal. However, if the oxidant is ineffective on certain SVOCs (e.g., BEHP), another oxidant might have to be found. Consequently, the confidence level is judged medium–high.



Criterion	Alternative Number	Alternative	Input Parameter	Justification
4.3 Short-term Effectiveness				
4.3.1 Length of Time to Remediate				
Time to Complete Waste Treatment ***(Number of Years)*** Scale: 1–4 years This subcriterion addresses the time from approval of the amended ROD until the tank waste is treated and retrieved or is in stable form (in the case of in situ treatments).	1 2 3 4 5 6 7	*ISV* *ESV* *TD on/off-Site* *TD on-Site* *TD off-Site* *IS-CO/S* *ES-CO/S*	2 2 2 2 2 2 2	The primary treatment for all alternatives is planned in FY 2005—2 years after the ROD amendment is signed. Similarly, all off-gas residues, whether treated on-Site or off-Site, appear to have identified TSDFs that should facilitate immediate treatment and disposal.

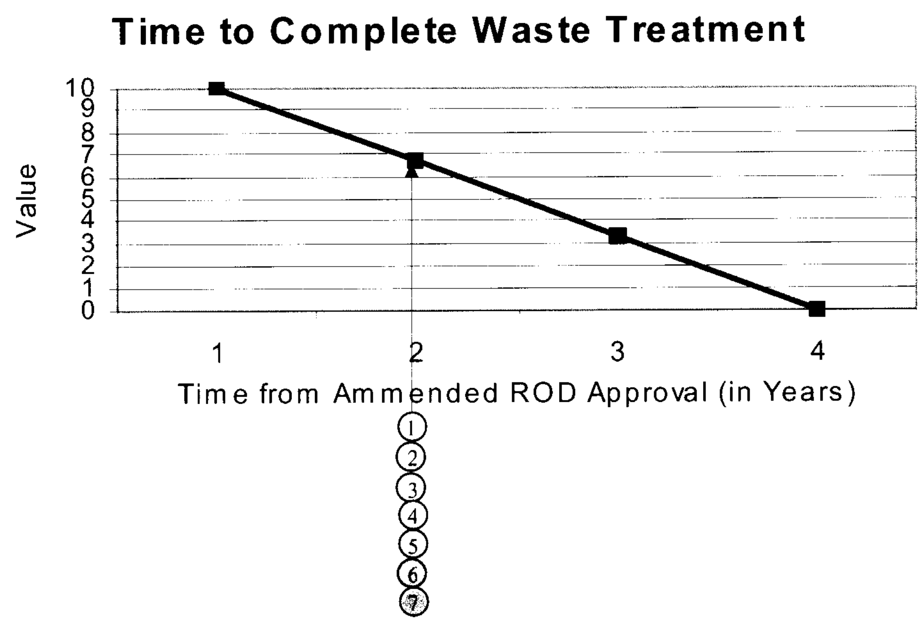
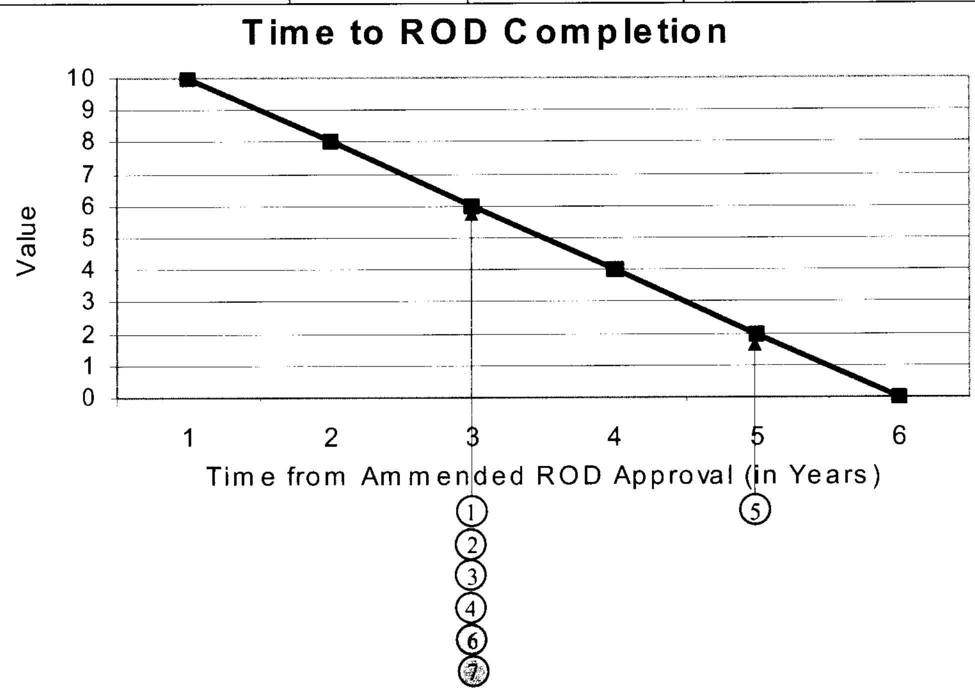


Table 17. (continued).

Criterion	Alternative Number	Alternative	Input Parameter	Justification
Time to ROD Completion ***(Number of Years)*** Scale: 1–6 years This subcriterion addresses the time to achieve site closure, and it is defined from approval of the amended ROD to when the ROD is fully implemented.	1 2 3 4 5 6 7	*ISV* *ESV* *TD on/off-Site* *TD on-Site* *TD off-Site* *IS-CO/S* *ES-CO/S*	3 3 3 3 5 3 3	Within 3 years of the ROD amendment, the ROD will be fully implemented (i.e., clean closure and all waste streams disposed of) for all alternatives, except off-Site TD. Off-Site TD has some uncertainty related to disposal of the bottoms' residue to WIPP, NTS, or Hanford. It is assumed on-Site interim storage would be required for 2 years (5 years total).



4.3.2 Community Protection

Criterion	Alternative Number	Alternative	Input Parameter	Justification
Shipments out of INEEL Scale: All untreated waste shipped out: 0-1.9 All treated waste shipped out: 2-3.9 Some untreated waste shipped out: 4–5.9 Some treated waste shipped out: 6-7.9 No waste shipped out: 8–10 This subcriterion satisfies CERCLA's requirement to address protection of the surrounding community during the remedial action.	1 2 3 4 5 6 7	*ISV* *ESV* *TD on/off-Site* *TD on-Site* *TD off-Site* *IS-CO/S* *ES-CO/S*	8 8 5 10 2 8 8	The vitrification and CO/S alternatives require disposal of their GAC beds off-Site, which, in turn, requires transportation of a solid, untreated waste. The remaining waste is sent to the ICDF. On/off-Site TD and off-Site TD both require transportation of some untreated liquid and solid waste off-Site. Off-Site TD also requires transport of the highly radioactive bottoms' residue off-Site and, therefore, poses the greatest risk. The on-Site TD alternative involves no off-Site shipments. Note: This criterion does not address shipments of material and chemicals to the site before waste shipment and does not consider the soil, since it is assumed to be shipped to the ICDF for all alternatives.

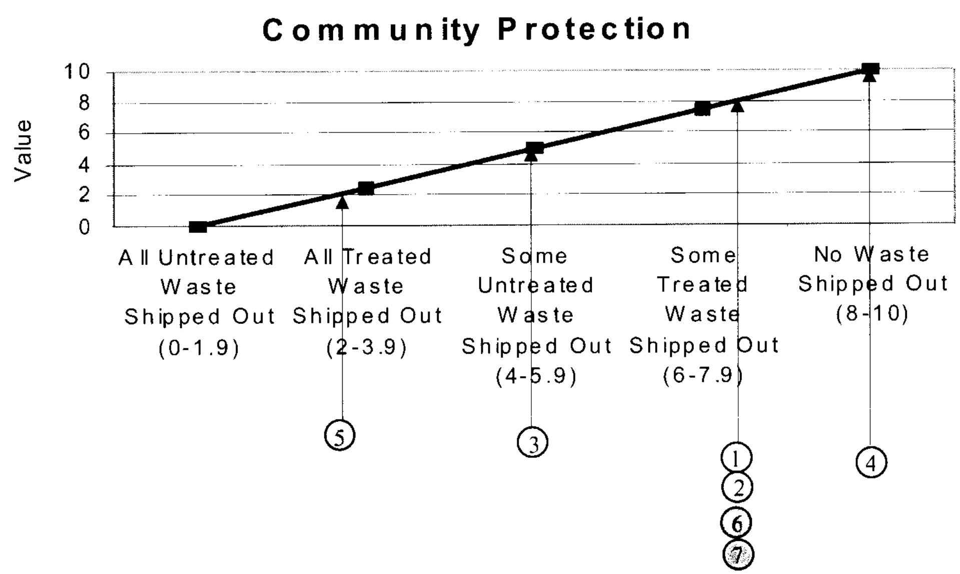
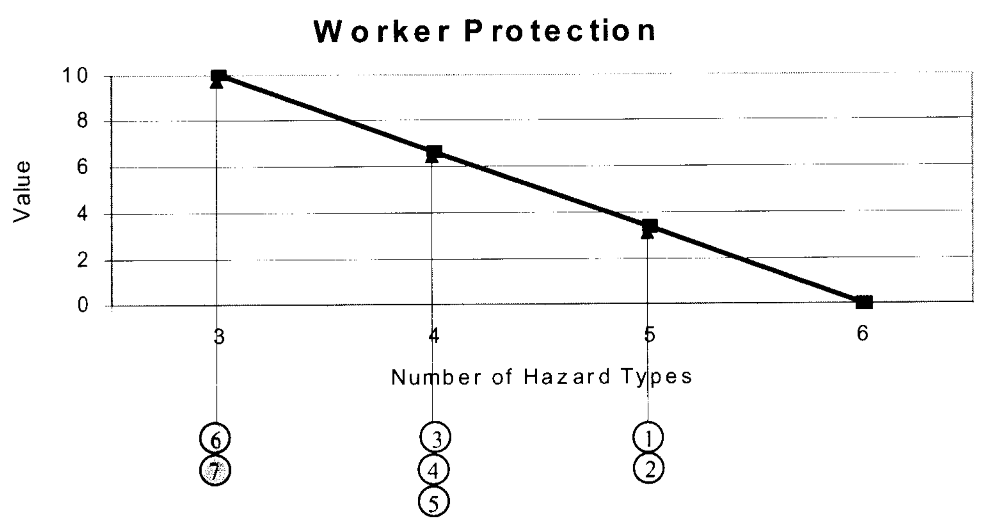


Table 17. (continued).

Criterion	Alternative Number	Alternative	Input Parameter	Justification
4.3.3 Worker Protection				
Number of Hazard Types **(1) Confined space entry** **(2) Radiological hazards** **(3) Industrial hazards** **(4) Potential fire/explosion hazards** **(5) Hazardous chemicals in process** **(6) Airborne contaminants** **(7) Electrical hazards** Scale: 3–6 hazards This subcriterion addresses the type of hazards workers might be exposed to during remediation.	1 2 3 4 5 6 7	*ISV* *ESV* *TD on/off-Site* *TD on-Site* *TD off-Site* *IS-CO/S* *ES-CO/S*	5 5 4 4 4 3 3	All alternatives have radiological and industrial hazards (minimum of two hazards). The vitrification alternatives also include the potential for fire/explosions, airborne contaminants, and electrical hazards (total of five). The TD alternatives have fire and airborne contaminant potential (total of four). The CO/S alternatives introduce hazardous chemicals (total of three).



Criterion	Alternative Number	Alternative	Input Parameter	Justification
Complexity to Mitigate Worker Hazard Scale: Low complexity: 0–3.32 Medium complexity: 3.33–6.66 High complexity: 6.67–10 This factor adjusts the number of hazards based on the difficulty of mitigation.	1 2 3 4 5 6 7	*ISV* *ESV* *TD on/off-Site* *TD on-Site* *TD off-Site* *IS-CO/S* *ES-CO/S*	5 6 7 7 10 3 4	The hazards associated with vitrification have moderate complexity to mitigate, although ISV has less radiological hazard than ESV. The dusty environment created by the TD alternatives is relatively complex to mitigate (moderately high). Off-Site TD is judged highly complex to mitigate due to the higher radiation fields. The CO/S alternatives are judged to have only moderately low complexity for mitigation. The IS-CO/S has lower radiation exposure risk than ES-CO/S.

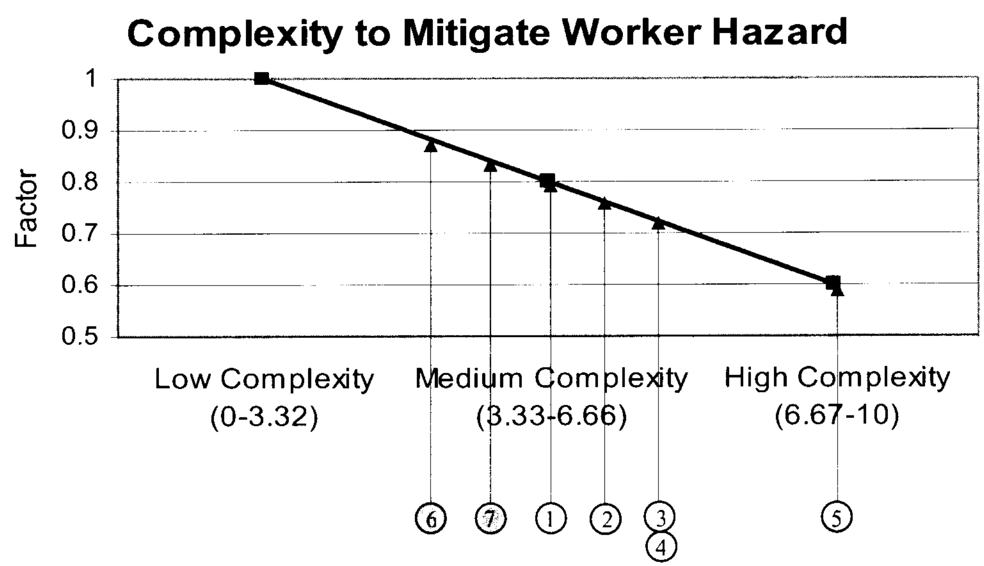
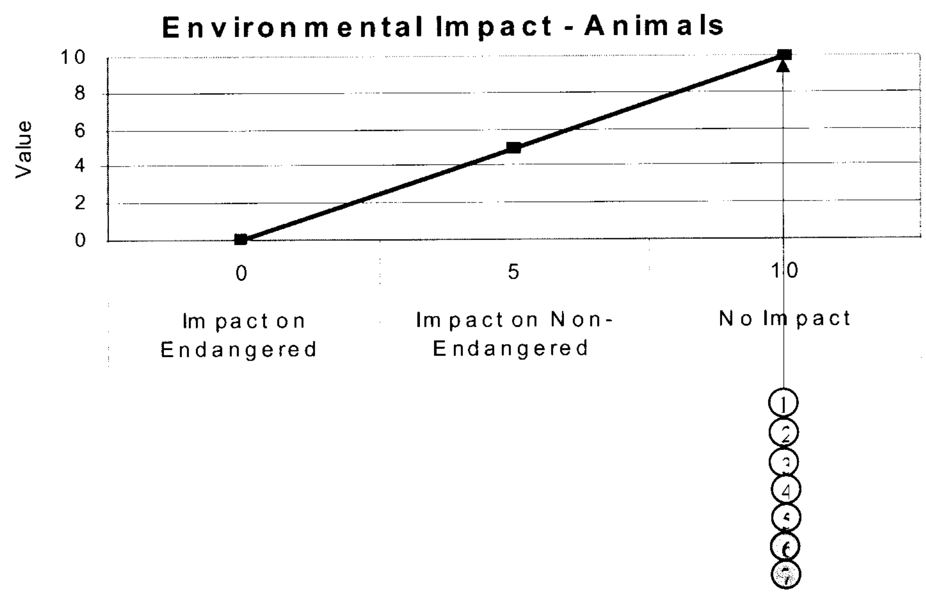


Table 17. (continued).

Criterion	Alternative Number	Alternative	Input Parameter	Justification
4.3.4 Environmental Impacts				
Animal Impact Scale: Impact on endangered: 0–3.32 Impact of non-endangered: 3.33–6.66 No impact: 6.67–10 This subcriterion addresses the impact on animals—particularly endangered animal species.	1 2 3 4 5 6 7	*ISV* *ESV* *TD on/off-Site* *TD on-Site* *TD off-Site* *IS-CO/S* *ES-CO/S*	10 10 10 10 10 10 10	No impacts for all alternatives.



Criterion	Alternative Number	Alternative	Input Parameter	Justification
Plant Impact Scale: Impact on endangered: 0–3.32 Impact of non-endangered: 3.33–6.66 No impact: 6.67–10 This subcriterion addresses the impact on plants—particularly endangered plant species.	1 2 3 4 5 6 7	*ISV* *ESV* *TD on/off-Site* *TD on-Site* *TD off-Site* *IS-CO/S* *ES-CO/S*	10 10 10 10 10 10 10	No impacts for all alternatives.

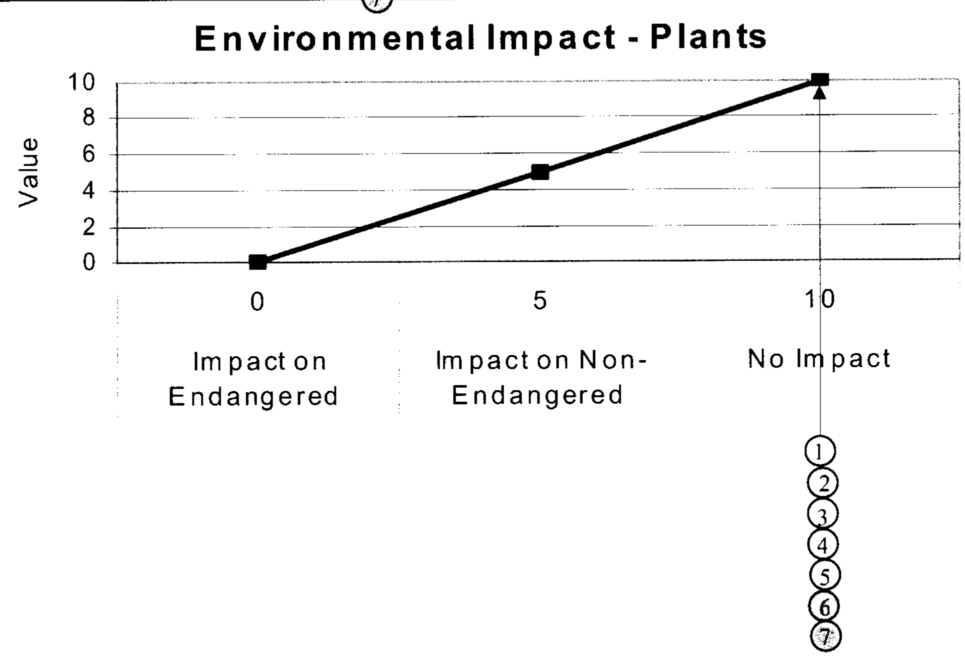
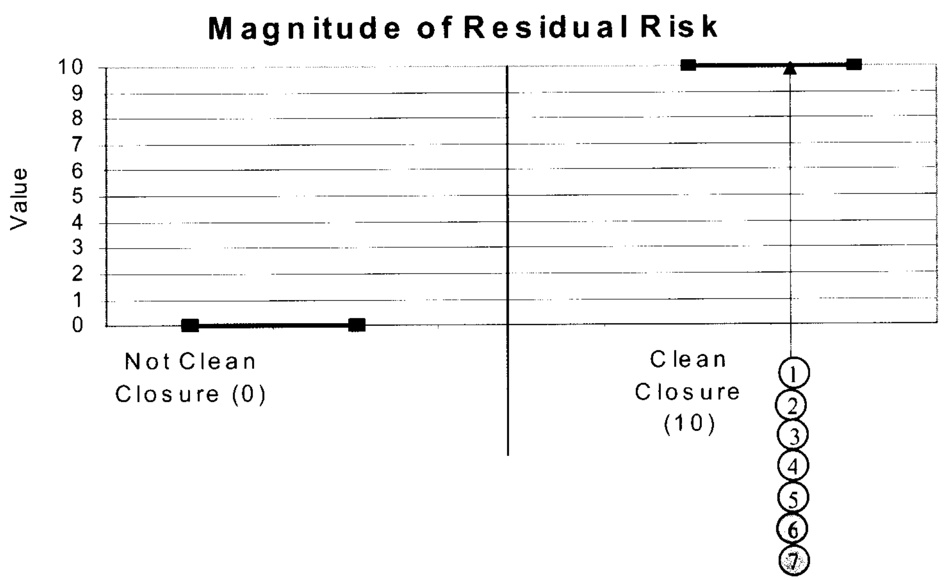


Table 17. (continued).

Criterion	Alternative Number	Alternative	Input Parameter	Justification
4.4 Long-term Effectiveness and Permanence				
4.4.1 Magnitude of Residual Risk Scale: Not clean closure: 0 Clean closure: 10 This subcriterion assesses the residual risk remaining from untreated waste or treatment residual at the conclusion of remedial activities.	1 2 3 4 5 6 7	*ISV* *ESV* *TD on/off-Site* *TD on-Site* *TD off-Site* *IS-CO/S* *ES-CO/S*	10 10 10 10 10 10 10	All alternatives achieve clean closure.



Criterion	Alternative Number	Alternative	Input Parameter	Justification
4.4.2 Adequacy and Reliability of Controls Scale: Not clean closure: 0 Clean closure: 10 This subcriterion addresses the adequacy and suitability of controls used to manage treatment residuals or untreated waste that remain at the site.	1 2 3 4 5 6 7	*ISV* *ESV* *TD on/off-Site* *TD on-Site* *TD off-Site* *IS-CO/S* *ES-CO/S*	10 10 10 10 10 10 10	All alternatives achieve clean closure.

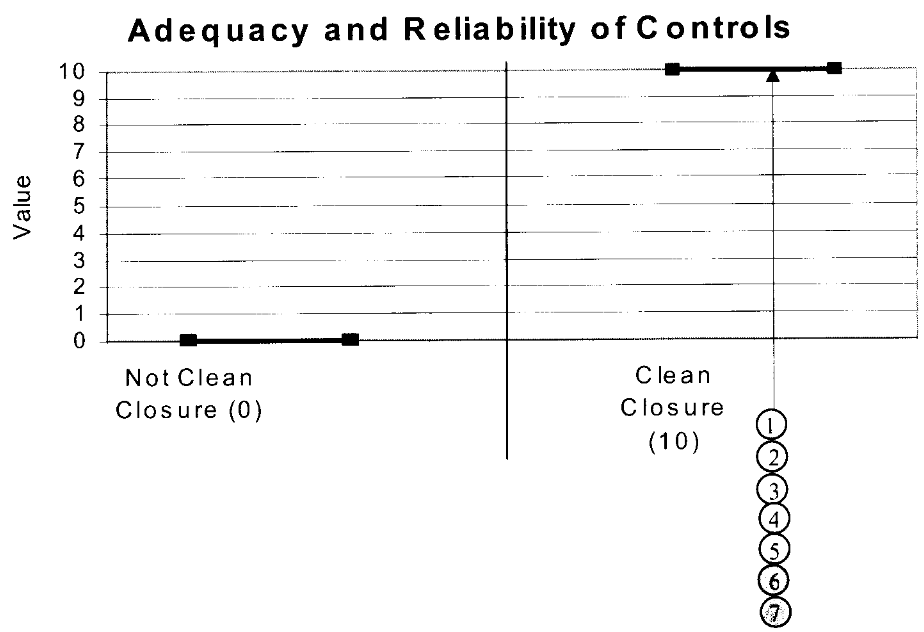
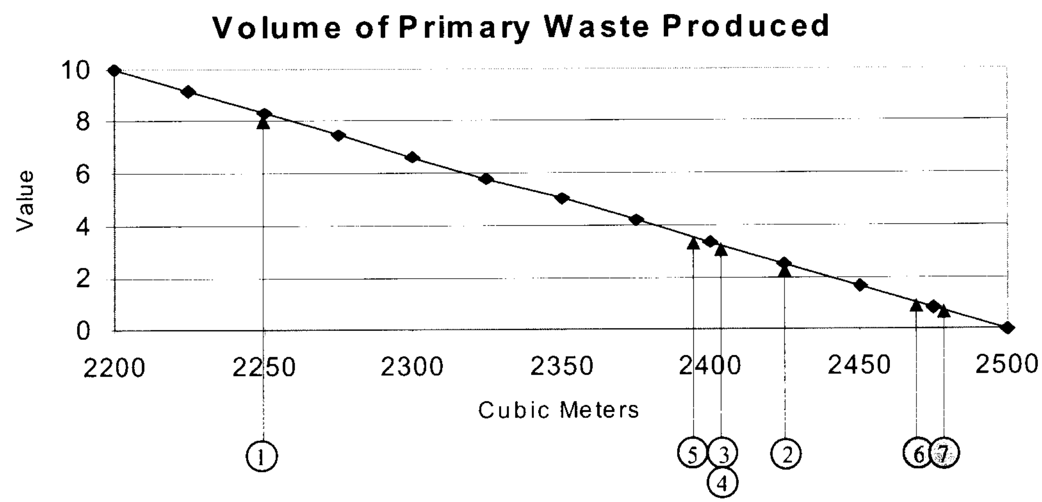


Table 17. (continued).

Criterion	Alternative Number	Alternative	Input Parameter	Justification
4.5 Reduction of Toxicity, Mobility, and Volume through Treatment				
4.5.1 Amount of Hazardous Material Destroyed or Treated—Note that the quantities used as input parameters for the following criteria are obtained directly from the Pre-Conceptual Design Report (INEEL 2002a). The concentrations given are those in the waste form following all treatments necessary to meet disposal facility requirements.				
Volume of Primary Waste Produced Scale: 2,200–2,500 m^3 This subcriterion addresses the amount of primary waste generated during the remedial action.	1 2 3 4 5 6 7	*ISV* *ESV* *TD on/off-Site* *TD on-Site* *TD off-Site* *IS-CO/S* *ES-CO/S*	2,250 2,427 2,407 2,407 2,397 2,462 2,469	The volume of primary waste (m^3) includes the soil and tanks, plus the vitrified waste or the TD bottoms' residue, or the grouted waste after chemical oxidation/reduction (as appropriate for each technology).



Criterion	Alternative Number	Alternative	Input Parameter	Justification
Transuranic Concentration Scale: <10, 10–100, >100 nCi/g This subcriterion addresses the transuranic concentration in the final V-Tank contents' waste form relative to various waste acceptance criteria.	1	*ISV*	0.45	All alternatives, except off-Site TD, have primary waste streams whose TRU concentrations are below 10 nCi/g. Calculations indicate that the off-Site TD alternative produces a waste stream with less than 100 nCi/g. Therefore, it is assumed that this material will likely be disposed of at NTS or Hanford. (Disposal at the WIPP is possible if the waste can be mixed with higher TRU content waste, such that the average is >100 nCi/g.)
	2	*ESV*	6.4	
	3	*TD on/off-Site*	0.82	
	4	*TD on-Site*	0.82	
	5	*TD off-Site*	70.9	
	6	*IS-CO/S*	2.2	
	7	*ES-CO/S*	2.2	

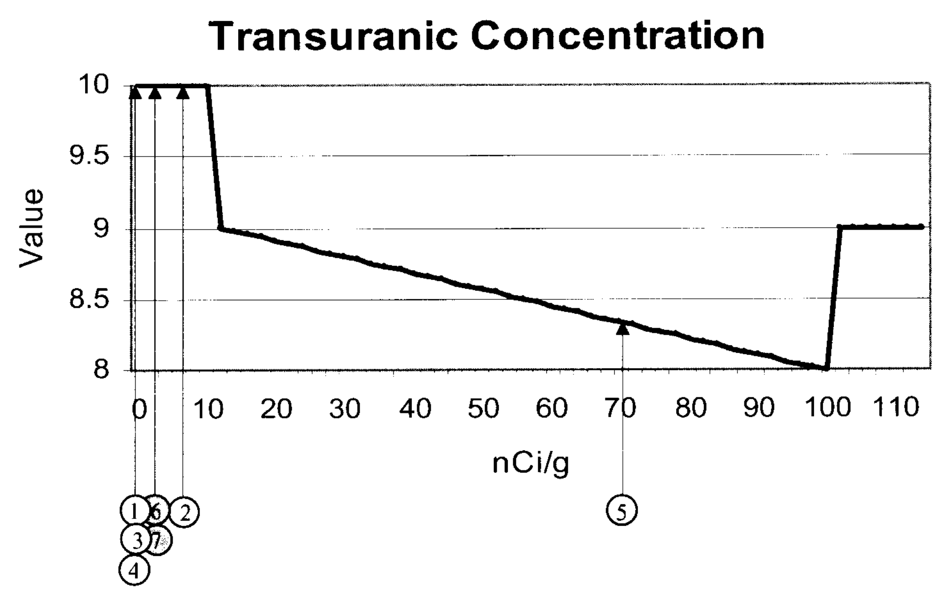
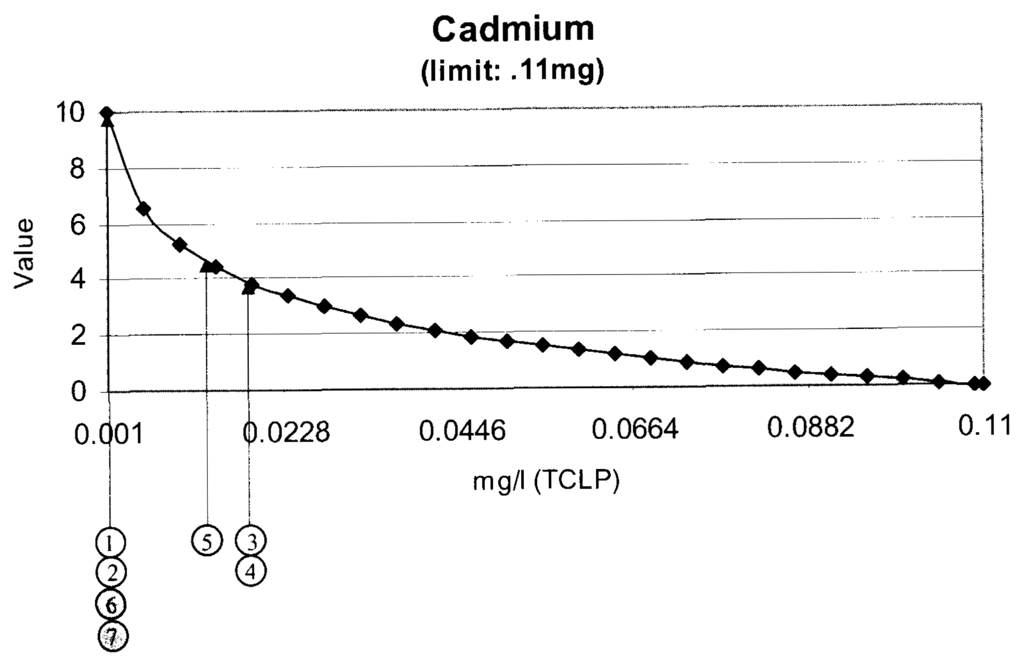


Table 17. (continued).

Criterion	Alternative Number	Alternative	Input Parameter	Justification
Cadmium TCLP Concentration Scale: 0.11–0.0011 mg/L (assumes UTS limits apply) These next six subcriteria address the concentration of certain hazardous constituents in the final waste form relative to the UTSs.	1 2 3 4 5 6 7	*ISV* *ESV* *TD on/off-Site* *TD on-Site* *TD off-Site* *IS-CO/S* *ES-CO/S*	0 0 0.019 0.019 0.0163 0.00011 0.00011	Essentially, all the cadmium will be volatilized during vitrification; therefore, it will not remain in the primary waste form. The cadmium will not volatize during TD. The TD bottoms' residue does not require stabilization to meet LDRs, except in the case of TD off-Site where soil was not added. The CO/S will stabilize the cadmium. It should be noted that cadmium has been somewhat difficult to stabilize, but the concentrations are low enough that any leachability issues should be avoided. Note: To estimate TCLP concentration for cadmium, lead and mercury, the following leachability ratios (total constituent concentration divided by TCLP concentration—based on extrapolated data) were used for all metals: soil = 100; grout = 10,000; Glass = 1,000,000.



Criterion	Alternative Number	Alternative	Input Parameter	Justification
Lead TCLP Concentration Scale: 0.75–0.0075 (assumes UTS limits apply)	1 2 3 4 5 6 7	*ISV* *ESV* *TD on/off-Site* *TD on-Site* *TD off-Site* *IS-CO/S* *ES-CO/S*	0.000014 0.00021 0.26 0.26 0.23 0.0016 0.0016	Lead will be captured in the glassified waste form during vitrification. The TD bottoms' residue does not require stabilization to meet LDRs, except in the case of TD off-Site. The CO/S will stabilize the lead.

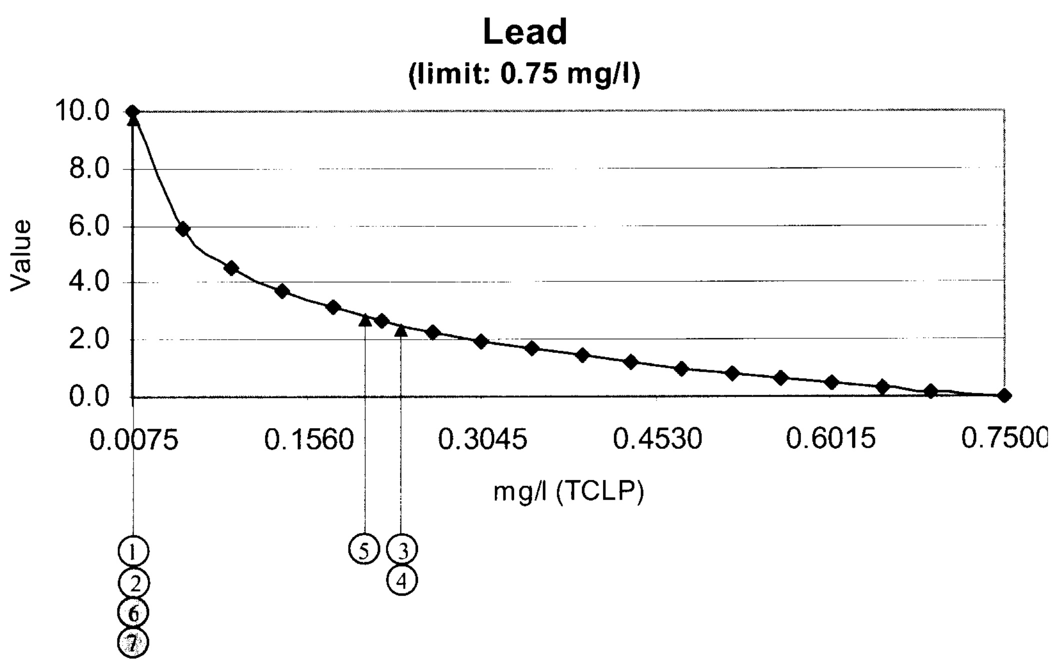
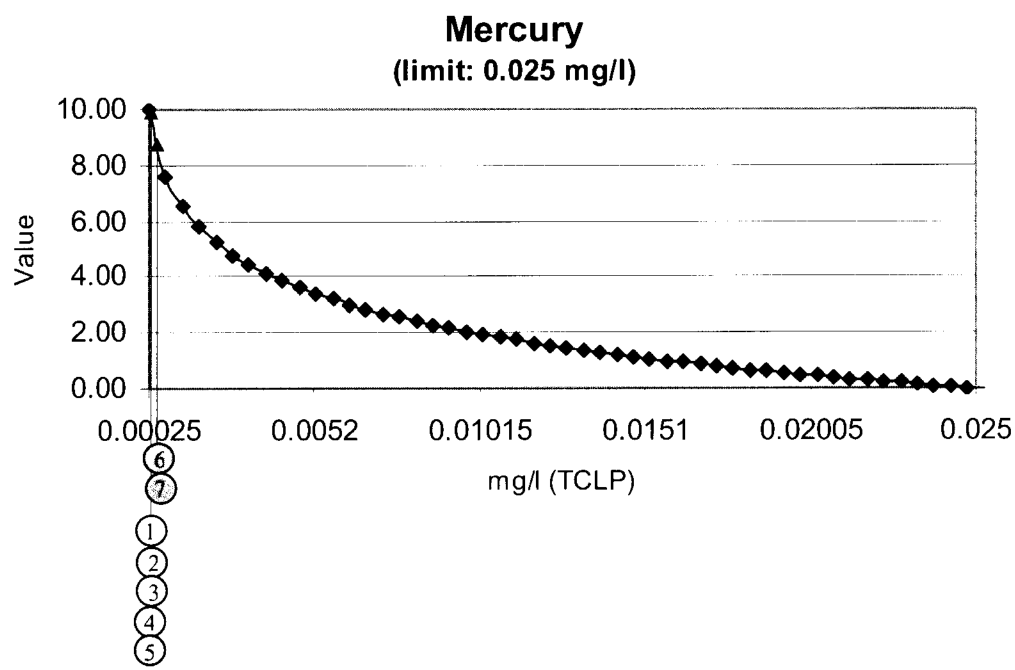


Table 17. (continued).

Criterion	Alternative Number	Alternative	Input Parameter	Justification
Mercury TCLP Concentration Scale: 0.025–0.00025 mg/L (assumes UTS limits apply)	1	*ISV*	0	Vitrification and TD "retort" the mercury, thereby effectively removing it from the primary waste form. The CO/S will stabilize the mercury, probably using a sulfur-containing grout.
	2	*ESV*	0	
	3	*TD on/off-Site*	0.00019	
	4	*TD on-Site*	0.00019	
	5	*TD off-Site*	0.00017	
	6	*IS-CO/S*	0.0013	
	7	*ES-CO/S*	0.0013	



Criterion	Alternative Number	Alternative	Input Parameter	Justification
TCE Concentration Scale: 6–0.06 ppm (LDR for F001)	1 2 3 4 5 6 7	*ISV* *ESV* *TD on/off-Site* *TD on-Site* *TD off-Site* *IS-CO/S* *ES-CO/S*	0 0 0 0 0 0.7 0.7	The vitrification and TD alternatives will effectively destroy or remove all the TCE from the primary waste stream. The CO/S will destroy or remove the TCE concentration below LDRs, but some residuals will remain. Because of the high concentration of TCE in Tank V-9, this could be the most difficult constituent for CO/S to remove, even though it is relatively easy to destroy compared to PCBs and some other SVOCs (e.g., BEHP). Furthermore, as noted earlier, CO/S can evaporate VOCs and collect them on a GAC bed in the unlikely event the oxidation/reduction step is not completely effective. Although not reflected in the mass balances, achieving sufficiently low concentrations will be more difficult for IS-CO/S than ES-CO/S, since more aggressive conditions (e.g., higher temperatures) can be applied more easily ex situ than in situ due to uncertainties with V-Tank integrity under these conditions. Note that TCE limits are based on total concentrations, not TCLP.

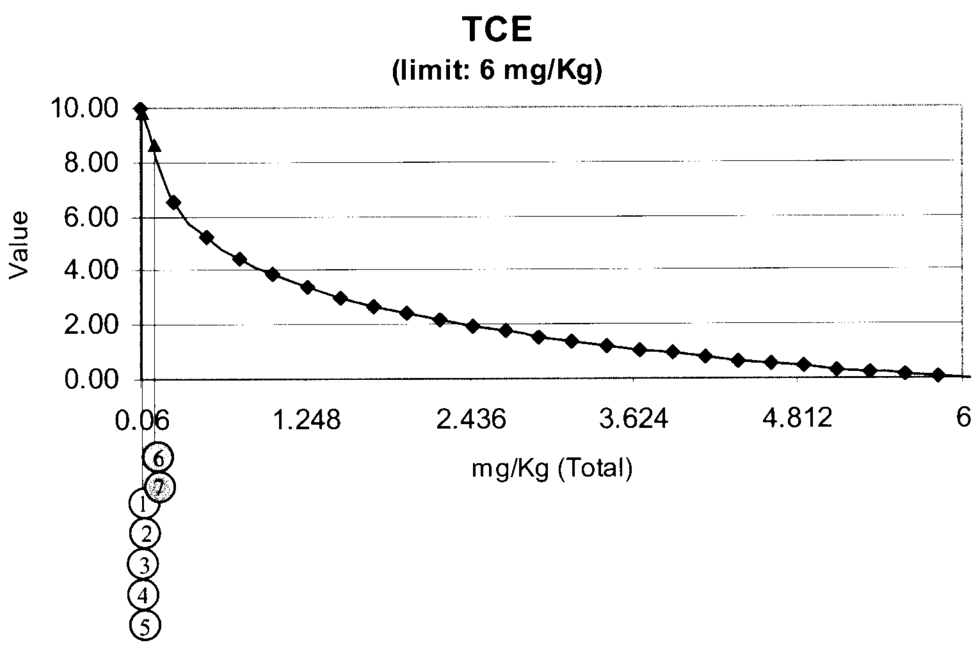
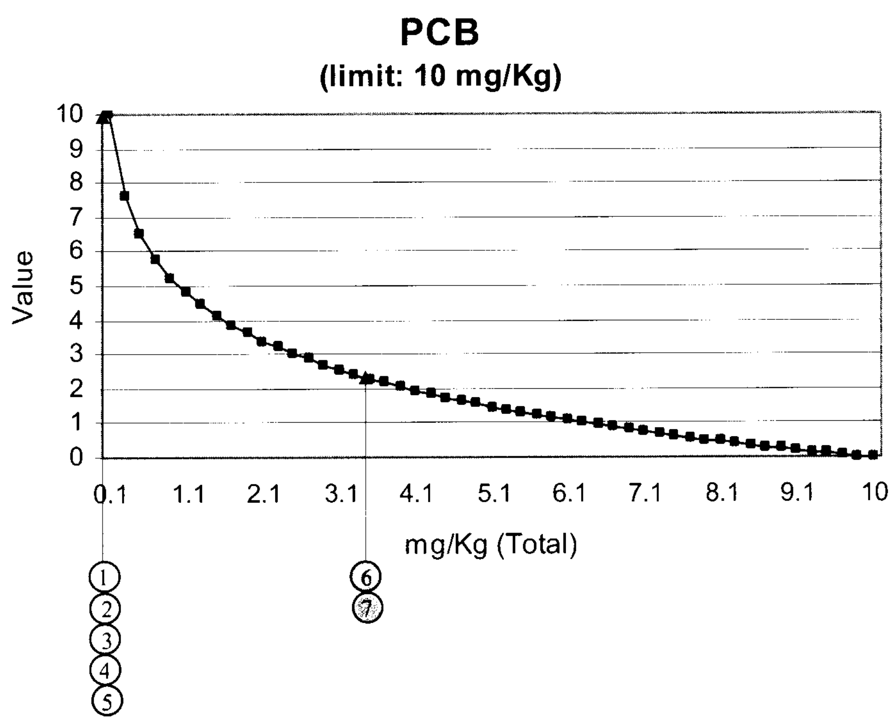


Table 17. (continued).

Criterion	Alternative Number	Alternative	Input Parameter	Justification
PCB Concentration Scale: 0.1–10 ppm (assumes UTS limits apply)	1 2 3 4 5 6 7	*ISV* *ESV* *TD on/off-Site* *TD on-Site* *TD off-Site* *IS-CO/S* *ES-CO/S*	0 0 0.0034 0.0034 0.000031 3.3 3.3	The vitrification and TD alternatives will effectively destroy or remove the PCBs from the primary waste stream. The CO/S will destroy PCBs to below LDRs, but some residuals will remain. Note that PCB limits are based on total concentrations, not TCLP.



Criterion	Alternative Number	Alternative	Input Parameter	Justification
BEHP Concentration Scale: 0.28–28 ppm (assumes UTS limits apply)	1 2 3 4 5 6 7	*ISV* *ESV* *TD on/off-Site* *TD on-Site* *TD off-Site* *IS-CO/S* *ES-CO/S*	0 0 0 0 0 20 20	The vitrification and TD alternatives will effectively destroy or remove BEHP from the primary waste stream. The CO/S will destroy BEHP to below LDRs, but some residuals will remain. Note that BEHP limits are based on total concentration, not TCLP.

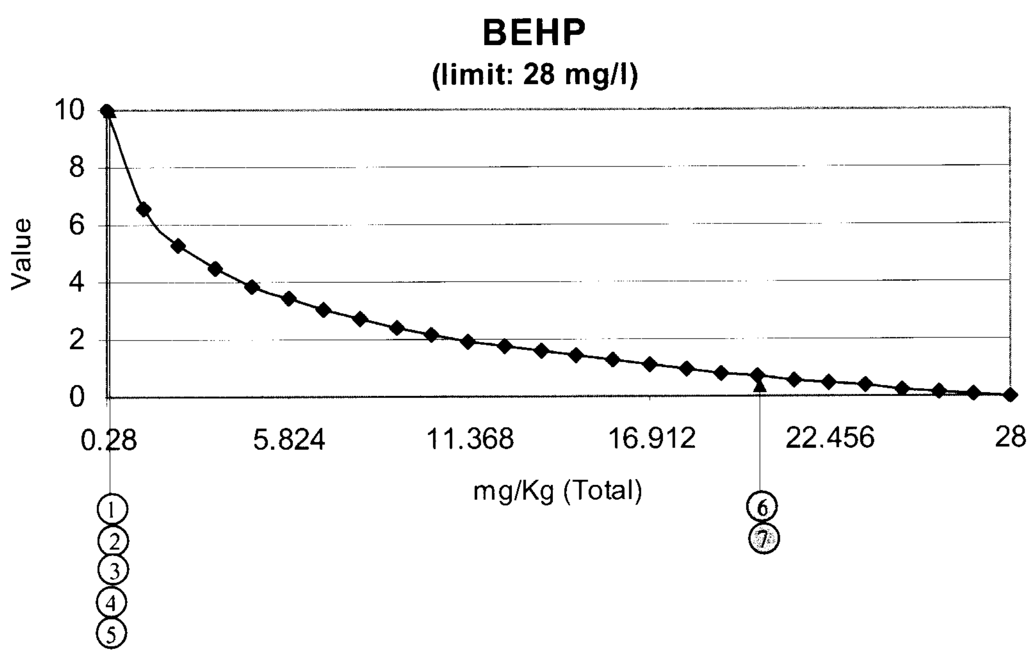
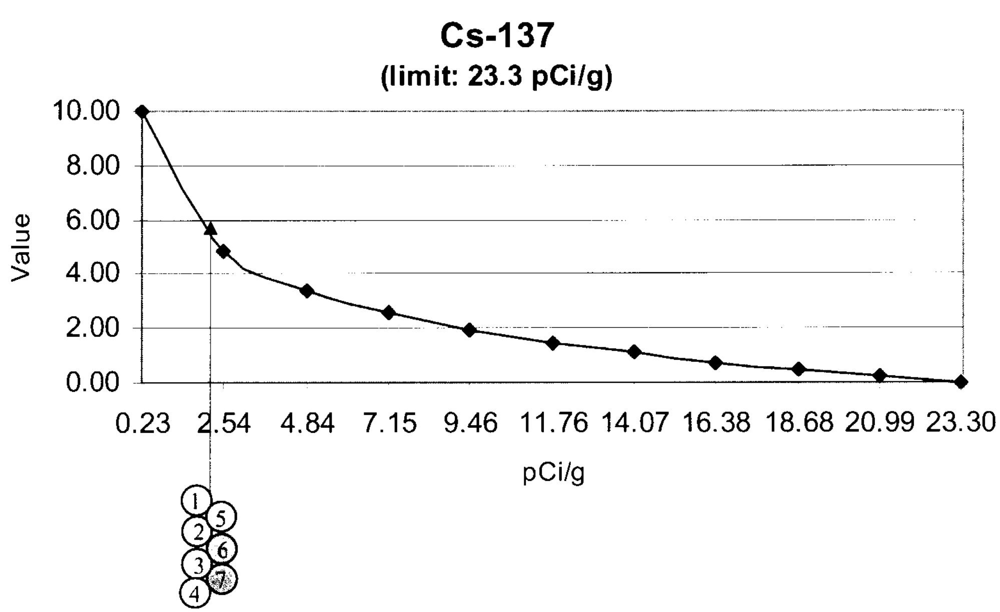


Table 17. (continued).

Criterion	Alternative Number	Alternative	Input Parameter	Justification
4.5.2 Amount of Principal Threat Treated to Reduce Toxicity, Mobility, or Volume				
Principal Threat Cs-137 Scale: 0.233–23.3 pCi/g This subcriterion applies only to the residual Cs-137 remaining in the soil following remediation.	1 2 3 4 5 6 7	*ISV* *ESV* *TD on/off-Site* *TD on-Site* *TD off-Site* *IS-CO/S* *ES-CO/S*	2.33 2.33 2.33 2.33 2.33 2.33 2.33	All alternatives accomplish clean closure. It is assumed that soil will be removed from the V-Tank area of contamination until the cesium concentration in the remaining soil is reduced to 2.33 pCi/g.



Criterion	Alternative Number	Alternative	Input Parameter	Justification
4.5.3 Irreversibility of Treatment of Contaminants				
Irreversibility Scale: 0–10,000 years No change in mobility: 0–2.4 Mobility reverses in <100 years: 2.5–4.9 Mobility reverses in <1,000 years: 5–7.4 Mobility reverses in <10,000 years: 7.5–10 This subcriterion addresses integrity of the final primary waste form as disposed.	1 2 3 4 5 6 7	*ISV* *ESV* *TD on/off-Site* *TD on-Site* *TD off-Site* *IS-CO/S* *ES-CO/S*	>10,000 >10,000 1,000 1,000 2,000 2,000 2,000	Vitrified glass is nonreversible for at least 10,000 years based on testing completed to date. Furthermore, a number of the CFTs are removed from the primary waste stream during vitrification, as described previously. Similar to vitrification, several CFTs (e.g., mercury, PCBs, and TCE) are removed during TD. Calculations on the TD bottoms' residue with soil (TD on/off-Site and TD on-Site alternatives) indicate that any remaining CFTs will be below LDR limits without subsequent stabilization. Therefore, the design life of the ICDF (1,000 years) is used as the duration for this criterion. In the case of TD off-Site, the residue will be stabilized and disposed of in a location with at least a 1,000-year design life. Therefore, since typical grouts are stable for at least 1,000 years, the overall duration for irreversibility is expected to be 2,000 years. For CO/S, the organics are removed before disposal. The metals and radionuclides will be stabilized. Because of the low concentration of these constituents, stabilization is actually done primarily as a means to solidify the waste rather than to render it nonleachable. However, the grouted waste form is not as stable as the glass and is generally estimated to prevent mobility for at least 1,000 years, and it is disposed of at the ICDF, which has a 1,000-year design life (i.e., 2,000 years total).

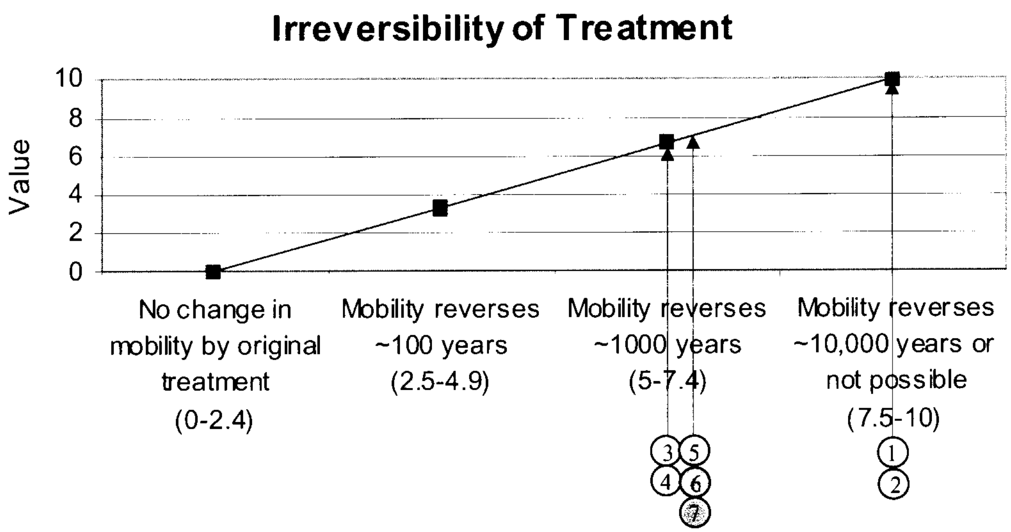
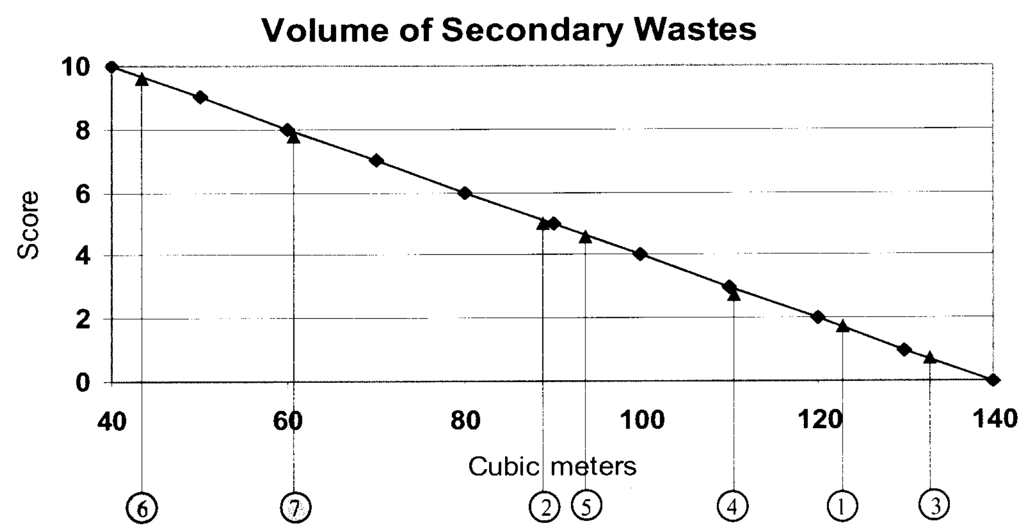


Table 17. (continued).

Criterion	Alternative Number	Alternative	Input Parameter	Justification
4.5.4 Amount of Treatment Residuals Remaining after Treatment				
Secondary Waste Volume Scale: 40–140 m^3 This subcriterion addresses the total volume of secondary waste generated during the remedial action.	1 2 3 4 5 6 7	*ISV* *ESV* *TD on/off-Site* *TD on-Site* *TD off-Site* *IS-CO/S* *ES-CO/S*	123 88 133 110 93 44 60	Secondary waste includes all the off-gas residuals and process equipment that comes in contact with the waste streams. Minimal credit was allowed for possible size reduction on certain equipment/components.



Criterion	Alternative Number	Alternative	Input Parameter	Justification
4.6 Cost				
Life-Cycle Cost (***Net Present Value***) Scale: $22.1–$38.9M—range based on estimates at -25/+15% This subcriterion addresses the total life cycle for the V-Tanks' remedial action. Cost is reported as net present value.	1 2 3 4 5 6 7	*ISV* *ESV* *TD on/off-Site* *TD on-Site* *TD off-Site* *IS-CO/S* *ES-CO/S*	33.0 32.7 30.3 30.3 33.8 29.5 29.4	These numbers are supported by alternative, specific cost estimates (see Appendix A). These life-cycle estimates are at a preconceptual level of detail and accuracy (+50/-30%). Included are historical costs, since the initial ROD remedy was established, and all currently planned future costs. This includes outyear costs associated with institutional controls (i.e., operation and maintenance costs). The cost values have then been reported in terms of net present value, minus escalation costs.

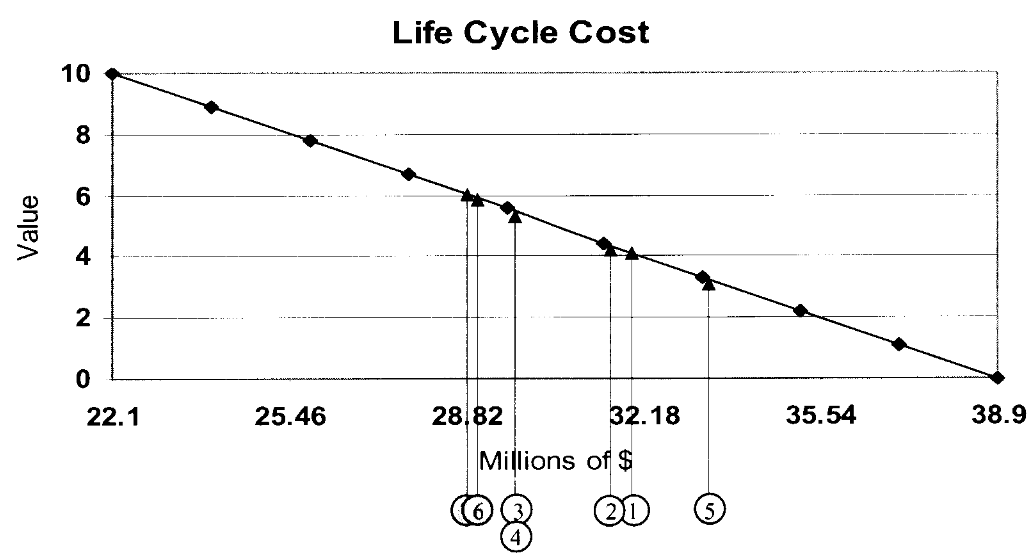
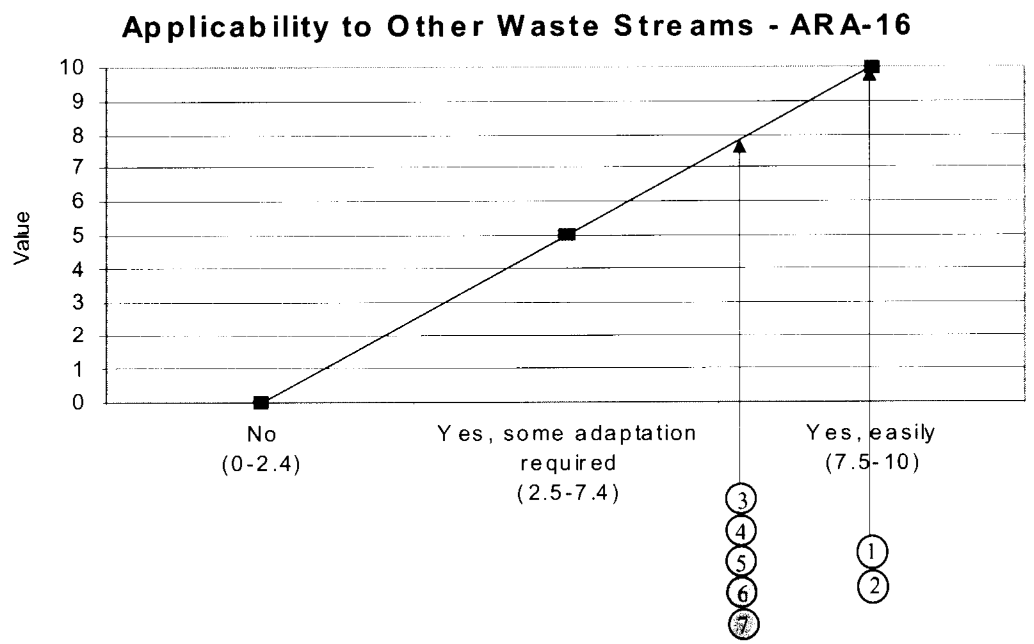


Table 17. (continued).

Criterion	Alternative Number	Alternative	Input Parameter	Justification
4.7 Applicability to Other INEEL CERCLA Waste Streams				
Applicability to ARA-16 Waste Scale: Not applicable: 0–2.4 Some adaptation required: 2.5–7.4 Easily adapted: 7.5–10 These next three subcriteria address the ability of the treatment alternative to satisfactorily treat other comparable INEEL CERCLA waste streams.	1 2 3 4 5 6 7	*ISV* *ESV* *TD on/off-Site* *TD on-Site* *TD off-Site* *IS-CO/S* *ES-CO/S*	10 10 8 8 8 8 8	All options are easily adapted to treat ARA-16 tank waste. This waste is contained in a sludge high-integrity container and will require removal prior to treatment by all alternatives, except vitrification, where it may be possible to place the entire high-integrity container into the V-Tank or roll-off container before vitrification. The sludge-like material is comparable to the V-Tank sludge. It does not have significant amounts of mercury, but contains some of the same CFTs.



Criterion	Alternative Number	Alternative	Input Parameter	Justification
Applicability to PM-2A Waste Scale: Not applicable: 0–2.4 Some adaptation required: 2.5–7.4 Easily adapted: 7.5–10	1 2 3 4 5 6 7	*ISV* *ESV* *TD on/off-Site* *TD on-Site* *TD off-Site* *IS-CO/S* *ES-CO/S*	10 10 10 10 10 7 7	Vitrification and TD are easily adapted to treat the PM-2A tank waste, since it is solidified waste and can simply be used in place of or in addition to soil. The CO/S could be adapted but, due to the addition of diatomaceous earth, mixing would become more complicated. Note: PM-2A tank waste consists essentially of V-Tank sludge mixed with diatomaceous earth.

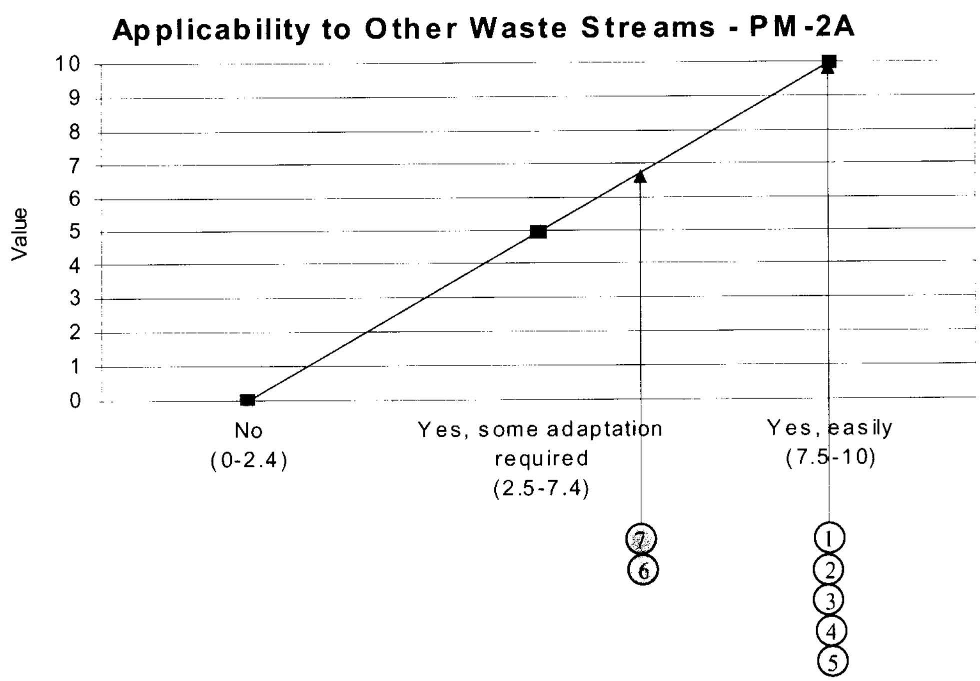
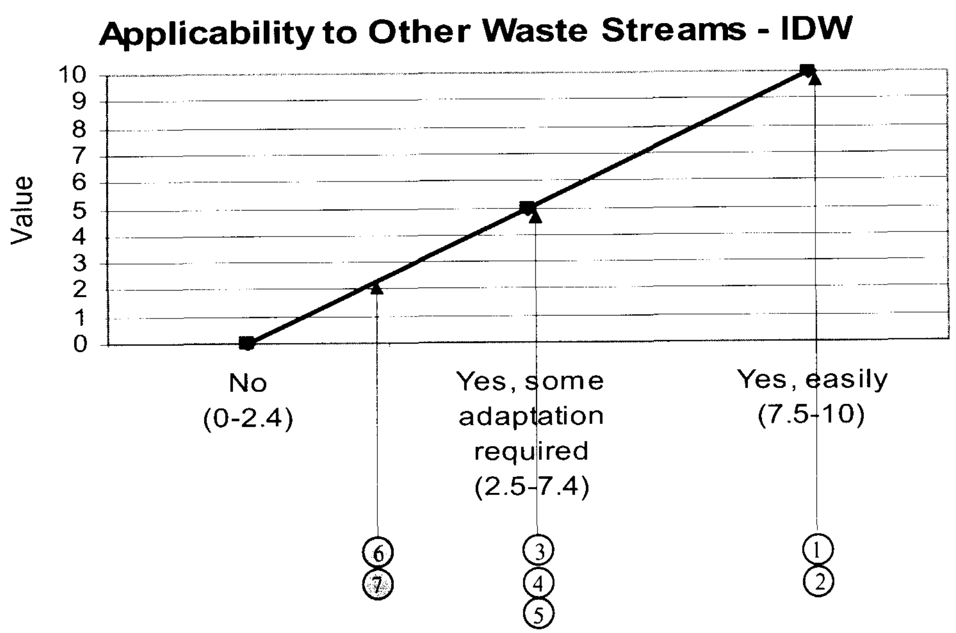


Table 17. (continued).

Criterion	Alternative Number	Alternative	Input Parameter	Justification
Applicability to Investigation-Derived Waste Scale: Not applicable: 0–2.4 Some adaptation required: 2.5–7.4 Easily adapted: 7.5–10	1 2 3 4 5 6 7	*ISV* *ESV* *TD on/off-Site* *TD on-Site* *TD off-Site* *IS-CO/S* *ES-CO/S*	10 10 5 5 5 2 2	Investigation-derived waste includes items such as used equipment, glass, PPE, and sample residue. Vitrification is judged to easily handle these materials. Thermal desorption can handle much of it, but not some of the equipment or glass. The CO/S would have a difficult time with much of the waste, except for the sample residue.



Criterion	Alternative Number	Alternative	Input Parameter	Justification

ARA = Auxiliary Reactor Area
BEHP = bis(2-ethylhexyl)phthalate
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
CFT = contaminant for treatment
CO/S = chemical oxidation/reduction with stabilization
DOE = U.S. Department of Energy
DRE = destruction and removal efficiency
ES-CO/S = ex situ chemical oxidation/reduction followed by stabilization
ESV = ex situ vitrification
FY = fiscal year
GAC = granular-activated carbon
ICDF = INEEL CERCLA Disposal Facility
INEEL = Idaho National Engineering and Environmental Laboratory
IS-CO/S = in situ chemical oxidation/reduction followed by stabilization
ISV = in situ vitrification
LDR = land disposal restriction
NTS = Nevada Test Site
OR = operational readiness
PCB = polychlorinated biphenyl
PCE = tetrachloroethylene
PPE = personal protective equipment
ROD = Record of Decision
SD = safety documentation
SGAC = sulfur-impregnated granular-activated carbon
SVOC = semivolatile organic compound
TD = thermal desorption
TCE = trichloroethylene
TO = thermal oxidizer
TRU = transuranic
TS&D = treatment, storage, and disposal
TSCA = Toxic Substances Control Act
TSDF = Treatment, Storage, and Disposal Facility
UTS = universal treatment standard
VOC = volatile organic compound
WIPP = Waste Isolation Pilot Plant

6. SELECTION OF PREFERRED ALTERNATIVE

6.1 Identification of Preferred Alternative

Ex situ chemical oxidation/reduction with stabilization is the preferred alternative for treatment of the V-Tank contents. This recommendation is consistent with the outcome of the decision support model as well as follow-on analysis and discussion with the Agencies.

The results of the decision support model are provided in Table 18 and are summarized at the major criteria level. (Appendix C contains a detailed output of the model for each of the subcriteria.) Figure 49 shows a relative comparison of the various alternatives compared to the mean score for all seven alternatives. As illustrated, ES-CO/S received the highest score of the seven alternatives. However, five of the six other alternatives scored only slightly lower (within 5%). This reflects an excellent choice for the selected alternatives and resulted in the need for additional sensitivity analyses, evaluations, and discussions.

Sensitivity analyses and a pair-wise comparison were performed, at the Agencies' request (during the October 22–23 meeting), to evaluate how the predetermined criteria and weighting factors affected the recommended outcome. As an example, one of the sensitivity analyses evaluated potential off-Site disposal of all waste for all the alternatives. This effectively reduced the score of all the alternatives to a level comparable with Alternative 2.c—TD off-Site, which received the lowest overall score. Results of the sensitivity analysis indicated that changes to the weighting factors could alter the relative rankings of six of the seven alternatives, but that the observed change in "technology value" was not significant enough to support a change in the recommended technology or the preestablished weighting factors. Furthermore, some of the input data from the preconceptual designs did not provide the discrimination between alternatives anticipated at the time the weighting was established. For example, criteria such as long-term effectiveness and time to remediate were evaluated the same for all alternatives. However, rather than eliminate these criteria and assign their weighting to another criterion, it was decided to retain the preestablished values.

Key criteria that tended to distinguish between alternatives, such as administrative feasibility, were evaluated further with the Agencies. After additional investigation and discussion, the regulatory approvals necessary to ensure that ES-CO/S remains a viable alternative were clearly delineated. Specific ARARs for the alternative treatments and risk-based disposal were identified that will require Agency approval; these ARARs are listed in detail in Section 5.2.

Another pivotal criterion is the *ability to operate*. Although the process equipment for ES-CO/S is relatively simple, there are limited data about the DREs of various oxidants under comparable conditions. However, a treatability study conducted in 1998 on actual V-Tank waste (INEEL 1998) demonstrated over 99.4% DRE of TCE and 85.2% DRE of PCBs. Since these tests were performed without heating, and the observed DREs have been shown to be sufficient to achieve the LDRs, the technology appears viable. Nevertheless, additional testing will be conducted during the conceptual design phase to confirm the results of the previous study.

Table 18. Summary scoring results for V-Tank remediation alternatives.

	Impl.	Short-Term Effect	Long-Term Effect	Reduction of TMV	Cost	Other Waste Streams	Alternative Score
Alt 1.a (ISV)	6.93	6.33	10	7.79	4.05	9.99	**6.94**
Alt 1.b (ESV)	6.76	6.31	10	7.04	4.21	9.99	**6.77**
Alt 2.a (TD on/off-Site)	7.63	6.20	10	5.89	5.61	7.66	**6.92**
Alt 2.b (TD on-Site)	7.54	6.95	10	6.01	5.59	7.66	**7.10**
Alt 2.c (TD off-Site)	4.81	4.12	10	6.19	3.57	7.66	**5.26**
Alt 3.a (IS-CO/S)	7.11	7.25	10	5.82	6.07	5.66	**6.98**
Alt 3.b (ES-CO/S)	7.63	7.19	10	5.70	6.11	5.66	**7.12**

ES-CO/S = ex situ chemical oxidation/reduction followed by stabilization
ESV = ex situ vitrification
IS-CO/S = in situ chemical oxidation/reduction followed by stabilization
ISV = in situ vitrification
TD = thermal desorption
TMV = toxicity, mobility, or volume

As required by CERCLA, evaluation of the alternatives relative to the criteria was done on an absolute basis using the decision support model. A relative evaluation was made to further assist in the overall determination and selection of the preferred alternative primarily due to the closeness of the alternative scores. The relative evaluation was made by taking the range of the absolute scores for given criteria and adjusting it to a 0-to-10 scale. A score between 0–2 was assigned a "low" ranking, 2–8 was assigned a "medium" ranking, and 8–10 was assigned a "high" ranking. The results of this relative scoring will be provided in the proposed plan and further support selection of ES-CO/S as the preferred alternative. Ex situ chemical oxidation/reduction followed by stabilization scored high on all criteria except reduction of TMV, which was scored low on a relative basis due to the volume increase of the final waste form created from this type of treatment. In addition, it is the lowest cost alternative.

The ES-CO/S alternative is preferred over the other alternatives, because it is a low-temperature operation, with a simplified off-gas treatment system, that generates a stabilized waste, which will be disposed of at the ICDF. Compared to the ISV alternative, ES-CO/S has fewer potential hazards to workers, fewer monitoring concerns, lower costs, and higher system reliability, which more than offsets ISV's relative strengths regarding technology maturity, less primary waste volume, and increased treatment capability for investigation-derived waste. Compared to the ESV alternative, ES-CO/S has fewer potential hazards to workers, lower costs, and higher system reliability. Compared to the TD on/off-Site alternative, ES-CO/S has more controllable disposal facilities, fewer off-Site shipments, and fewer potential hazards to workers, which more than offsets TD on/off-Site's increased administrative feasibility. Compared to the TD on-Site alternative, ES-CO/S has fewer potential hazards to workers and higher system reliability. Compared to TD off-Site, ES-CO/S has fewer potential hazards to workers, more readily available disposal facilities, lower costs, fewer required off-Site shipments, better system reliability, and a shorter ROD completion time. The ES-CO/S's only significant strength over IS-CO/S is that design and operational uncertainties are reduced.

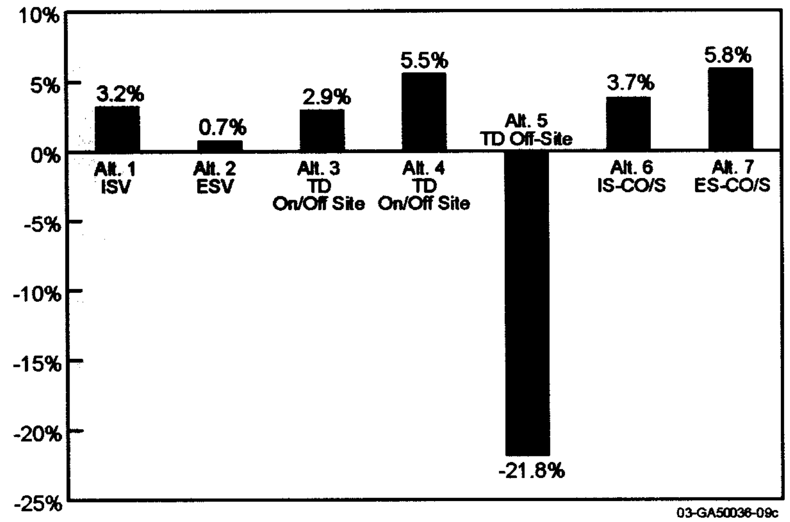


Figure 49. Summary scoring results for V-Tank remediation alternatives (deviation from the mean value rating for all seven technologies).

As noted in Section 1.2, it is currently assumed that the V-Tank waste is characteristically hazardous. This is a conservative assumption that stems from past analyses where the detection limits for some of the characteristically hazardous VOCs and SVOCs were above the regulatory limits. The actual concentration of these constituents is not known, but was conservatively assumed to be at the detection level. Future review of historical records and/or sampling, using lower detection limits, may be pursued to support the presumption that these trace contaminants might not be present in the V-Tank waste at characteristically hazardous levels. If this review/sampling shows that the hazardous VOCs and SVOCs are below regulatory levels, then the V-Tank waste will only require treatment of the listed constituent in the tank (i.e., the F001 hazardous organic, TCE). Otherwise, if the records review or sampling cannot negate the presence of these VOCs and SVOCs above regulatory levels, the V-Tank sludge will be treated as characteristically hazardous, thereby requiring additional treatment of the appropriate underlying hazardous constituents (e.g., PCBs and BEHP) to meet LDRs before disposal at the ICDF. Furthermore, in the unlikely event that the oxidant does not achieve LDR limits for certain VOCs, these can be evaporated from the waste and captured on a GAC filter. The GAC filter can subsequently be treated and disposed of. These considerations demonstrate the potential flexibility of ES-CO/S. (A more thorough discussion of the regulatory aspects is provided in the following section on ARARs.)

During the technology evaluation, a fact sheet (INEEL 2002b) was issued to the public identifying the need to modify the ROD and identifying the technologies being evaluated. Based on the fact sheet, briefings also were provided to four public stakeholder groups. Although input from the stakeholder groups (INEEL Citizens' Advisory Board, Coalition 21, Snake River Alliance, and Keep Yellowstone Nuclear Free) varied, it is generally perceived that the selected preferred alternative will find favor with the public primarily because it is a nonthermal process. (Note that formal community input on the preferred alternative will follow issuance of the proposed plan.)

Finally, these alternatives were evaluated based on the best available data at the time. It is recognized that additional alternatives (such as off-Site treatment systems) might become available in the future. In that event, the benefits of changing the specified remedy will be addressed.

6.2 Applicable or Relevant and Appropriate Requirements for the Preferred Alternative

The following potential ARARs have been generated specific to the preferred alternative. These will be modified, as necessary, and formally approved in the ROD amendment.

- CERCLA (40 CFR 300):
    - "Procedures for Planning and Implementing Off-Site Response Actions," 40 CFR 300.440
- "Rules for the Control of Air Pollution in Idaho" (IDAPA 58.01.01):
    - "Toxic Substances," IDAPA 58.01.01.161
    - "Toxic Air Pollutants Non-Carcinogenic Increments," IDAPA 58.01.01.585
    - "Toxic Air Pollutants Carcinogenic Increments," IDAPA 58.01.01.586
    - "Rules for Control of Fugitive Dust," IDAPA 58.01.01.650
    - "General Rules," IDAPA 58.01.01.651
    - "Compliance with Rules and Regulations," IDAPA 58.01.01.500.02
- "National Emission Standards for Hazardous Air Pollutants" (40 CFR 61):
    - "National Emission Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities," 40 CFR 61, Subpart H
    - "Emission Monitoring and Test Procedures," 40 CFR 61.93
    - "Compliance and Reporting," 40 CFR 61.94
- RCRA—"Standards Applicable to Generators of Hazardous Waste" (40 CFR 262):
    - "Hazardous Waste Determination," 40 CFR 262.11
    - "The Manifest," 40 CFR 262, Subpart B
    - "Packaging," 40 CFR 262.30
    - "Labeling," 40 CFR 262.31
    - "Marking," 40 CFR 262.32
    - "Placarding," 40 CFR 262.33
- RCRA—"Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities" (40 CFR 264):
    - "Purpose, Scope, and Applicability," 40 CFR 264.1
    - "Closure and Performance Standards," 40 CFR 264.111

- “Disposal or Decontamination of Equipment, Structures, and Soils,” 40 CFR 264.114
- “Use and Management of Containers,” 40 CFR 264, Subpart I
- “Condition of Containers,” 40 CFR 264.171
- “Compatibility of Waste with Containers,” 40 CFR 264.172
- “Management of Containers,” 40 CFR 264.173
- “Inspections,” 40 CFR 264.174
- “Containment,” 40 CFR 264.175
- “Special Requirements for Ignitable or Reactive Waste,” 40 CFR 264.176
- “Special Requirements for Incompatible Wastes,” 40 CFR 264.177
- “Closure,” 40 CFR 264.178
- “Design and Installation of New Tank Systems or Components,” 40 CFR 264.192
- “Containment and Detection of Releases,” 40 CFR 264.193
- “General Operating Requirements,” 40 CFR 264.194
- “Inspections,” 40 CFR 264.195
- “Response to Leaks or Spills and Disposition of Leaking or Unfit-for-Use Tank Systems,” 40 CFR 264.196
- “Closure and Post-Closure Care,” 40 CFR 264.197
- “Temporary Units (TU),” 40 CFR 264.553
- “Air Emission Standards for Process Vents,” 40 CFR 264 Subpart AA
- “Staging Piles,” 40 CFR 264.554

• RCRA—“Land Disposal Restrictions” (40 CFR 268):

- “Applicability of Treatment Standards,” 40 CFR 268.40
- “Variance from a Treatment Standard,” 40 CFR 268.44
- “Treatment Standards for Hazardous Debris,” 40 CFR 268.45
- “Universal Treatment Standards,” 40 CFR 268.48
- “Alternative LDR Treatment Standards for Contaminated Soil,” 40 CFR 268.49

- TSCA—"Toxic Substance Control Act" (40 CFR 700–799):
  - "Marking Formats," 40 CFR 761.45
  - "Applicability," 40 CFR 761.50
  - "Storage for Disposal," 40 CFR 761.65
  - "PCB Remediation Waste," 40 CFR 761.61
  - "Storage for Disposal," 40 CFR 761.69
- To Be Considered:
  - "Radiation Protection of the Public and the Environment," DOE Order 5400.5, Chapter II (1)(a, b)
  - Region 10 Final Policy on the Use of Institutional Controls at Federal Facilities.

6.2.1 Preliminary Resolution of Specific Applicable or Relevant and Appropriate Requirements

The following potential issues have been discussed with the Agencies and appear to be resolved through assignment of the associated ARARs and the subsequent submittal of the required documentation (e.g., risk-based petition and alternative treatment standards):

- Over approximately 30 years of operation, the V-Tanks collected waste from a multitude of processes at TAN. Typically, the waste was routed through Tank V-9 for solids removal and then collected in Tank V-1, Tank V-2, or Tank V-3, depending on the remaining available volume in each tank. Waste from multiple V-Tanks may be combined or mixed in various proportions for facilitating treatment by chemical oxidation/reduction and stabilization. All of the waste in Tanks V-1, V-2, V-3, and V-9 is considered one waste stream. Data from the various sampling events of the V-Tanks will be statistically combined (with the applicable statistical variance) to be representative of the entire waste stream. While concentrations of specific hazardous constituents may vary for each tank, the average concentration of the hazardous constituents (with applicable statistical variance) for all of the tanks will be used to determine applicable LDR treatment standards for the overall waste stream. Currently, the waste is characterized as F001. No other listed waste codes are applicable. Toxicity characteristic waste codes for non-F001 hazardous organic constituents or metals also could be applicable, depending on the results of further refined sampling that might be conducted. Sampling to date has not conclusively determined the applicability of these characteristic "D" codes due to interferences in the analysis. As a result of the detection limits for specific hazardous constituents exceeding the characteristic levels, it has been assumed that "D" characteristic codes are applicable. Treatment to meet the "D" code treatment standards and the UTS for all underlying hazardous constituents is planned, in addition to the applicable F001 treatment standards. If the additional sampling effort shows that the V-Tank waste does not exhibit any hazardous characteristic (no applicable "D" codes), then treatment goals will be modified to achieve compliance only with the applicable F001 treatment standard. The ROD amendment will address the results of the planned additional sampling and any modification of the treatment requirements.

- If the entire V-Tank waste stream has an average TCLP mercury concentration (with applicable statistical variance) that exceeds the characteristic toxicity level for mercury and exceeds 260 mg/kg of total mercury, then this waste will be subject to the LDR treatment standard of roasting or retorting mercury (RMERC) for high mercury waste. The RMERC standard was developed to promote recovery and recycling of mercury. Any mercury recovered from the V-Tanks via RMERC would remain radioactive and, thus, would not be recyclable. Therefore, because recycling that mercury would be inappropriate, the treatment standard of RMERC also is inappropriate. This provides the necessary rationale for preparing a petition for an alternative treatment standard under 40 CFR 268.44(a). A more appropriate alternative treatment standard would be to stabilize this mercury waste to reduce the mercury's leachability in this waste to less than 0.025 mg/L TCLP. This proposed alternative standard would be equivalent to the existing LDR treatment standard for low mercury waste. The ROD amendment will include that a petition requesting and justifying this alternative treatment standard has been prepared and approved, in accordance with the ARARs in 40 CFR 268.44(a).

- The waste in the V-Tanks is a sludge and contains PCBs over 50 mg/kg. As such, the V-Tank waste is regulated as a PCB remediation waste. Most of the PCBs are in the solid phase of the sludge. However, because the liquid phase will not be totally removed and the waste fails the paint filter test, the waste must still be regarded as a liquid PCB remediation waste under TSCA regulations. The treatment plan for this waste calls for chemical oxidation/reduction, stabilization, and disposal at the ICDF. The V-Tank waste currently meets the PCB concentration-based waste acceptance criteria (500 mg/kg) for disposal at the ICDF. However, management of liquid PCB remediation waste still requires approval under TSCA regulations. A risk-based petition under 40 CFR 761.61(c) will be prepared and submitted showing the planned treatment for the V-Tank waste, the final disposition at the ICDF, and the overall acceptable risk based on PCBs being managed according to this plan. As noted above, further sampling may be conducted to clarify whether the V-Tank waste is subject to further treatment standards based on a "D" characteristic code. It is currently assumed that "D" characteristic code(s) apply. Therefore, PCBs as an underlying hazardous constituent are planned to be treated to the RCRA UTS level of 10 mg/kg. The final treatment standard for PCBs will be determined due to the additional sampling. The ROD amendments will include that a risk-based petition has been prepared and approved, in accordance with the ARARs in 40 CFR 761.61(c).

- Any VOCs, mercury, or other hazardous constituents released during the chemical oxidation/reduction or stabilization processes and collected on the activated carbon, sulfur-impregnated carbon, or HEPA filters are considered a new waste stream with its own treatment requirements. These waste types will be characterized as F001 and then further characterized to determine if they exhibit any hazardous waste characteristics. Applicable treatment standards will be assigned based on these characterizations. These waste types will be tested to determine if they meet applicable LDR treatment standards, and they will be treated (as appropriate) after the treatment of the V-Tank waste is complete.

7. PREFERRED ALTERNATIVE PRESENTATION AND REMEDY SELECTION

The preferred alternative—chemical oxidation/reduction with stabilization—will be presented to the public for comment in a proposed plan, and the final remedy selection will be addressed in an amendment to the OU 1-10 ROD (DOE-ID 1999a). This section describes the process for presenting the preferred alternative to the public and selecting the new remedy. This section also identifies the deliverables and planned submittal dates for implementing the new remedy.

7.1 Proposed Plan and Record of Decision Amendment Process

A proposed plan will be prepared to present the preferred alternative to the public. Then, a ROD amendment will be prepared to select a new remedy for the V-Tanks. These documents will be prepared in accordance with the "National Oil and Hazardous Substances Pollution Contingency Plan" (40 CFR 300.435[c][2]) and EPA's guidance document, *A Guide to Preparing Superfund Proposed Plans, Records for Decision, and other Remedy Selection Decision Documents* (EPA 1999). In accordance with the Office of Solid Waste and Emergency Response guidance, a new proposed plan will be prepared and will include a 30-day public comment period. The proposed plan and ROD amendment preparation and review process will include the following steps:

- Prepare the draft proposed plan and submit to the Agencies for a 30-day review
- Place this Technology Evaluation Report in the Administrative Record
- Issue a public notice of availability for review and comment and a brief description of the proposed plan
- Make the proposed plan available for public comment
- Provide a 30-day period for submission of written or oral comments on the proposed plan. Upon timely request, extend the public comment period by at least 30 additional days
- Provide an opportunity for a public meeting
- Address and resolve, with Agency input, public comments
- Prepare the draft ROD amendment and submit to the Agencies for a 45-day review, followed by a 45-day comment resolution and incorporation period
- Include in the draft ROD amendment a responsiveness summary addressing each of the significant comments, criticisms, and any new, relevant information submitted during the public comment period of the proposed plan
- Publish the amended ROD
- Issue a public notice of availability (for information) of the amended ROD
- Place the amended ROD in the Administrative Record.

7.2 V-Tank Design Studies

Design studies will be conducted to confirm design parameters for the preferred alternative. The scope of these studies will be described in a design study work plan. Study results will be addressed in a design study report and will be used to provide information for the remedy detailed design.

7.3 V-Tanks Remedial Design/Remedial Action Scope of Work

A remedial design/remedial action scope of work for the V-Tanks will be prepared to outline scope and schedule for developing a new remedial design/remedial action work plan for the V-Tanks and supporting documents. The draft remedial design/remedial action scope of work will be submitted within 21 calendar days of the ROD amendment becoming final.

7.4 Deliverables and Working Schedule

Table 19 identifies the deliverables and working schedule dates for the proposed plan, ROD amendment, remedial design/remedial action scope of work for the V-Tanks, and design study work plan and report. This is an update to the deliverables table provided in Section 7 of the Technology Evaluation Scope of Work (DOE-ID 2002a).

Table 19. Deliverables for new V-Tank remedy implementation.

Deliverable	Planned Submittal Date	Enforceable Submittal Date	Review Duration in Calendar Days	Document Type
V-Tanks Proposed Plan and Record of Decision Amendment				
Draft Proposed Plan	1/31/03	NA	30	Secondary
Final Proposed Plan–Issued for Public Comment	4/13/03	NA	NA	
Draft ROD Amendment	7/31/03	12/31/03[a]	45	Primary
Draft Final ROD Amendment	10/30/03	NA	15	
Final ROD Amendment–Issued and Placed in Administrative Record	12/17/03	NA	NA	
Draft V-Tanks Remedial Design/Remedial Action Scope of Work	[b]	NA	30	Other
V-Tanks Preliminary Design Study				
Draft Design Study Work Plan	1/14/03	NA		Secondary
Draft Design Study Work Report	7/29/03	NA		Secondary

a. The enforceable date for the ROD amendment will be confirmed by a letter from the DOE-ID to the EPA and IDEQ.
b. The draft remedial design/remedial action scope of work will be submitted 21 calendar days after the ROD amendment becomes final.
DOE-ID = U.S. Department of Energy Idaho Operations Office
EPA = U.S. Environmental Protection Agency
IDEQ = Idaho Department of Environmental Quality
ROD = Record of Decision

8. REFERENCES

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